TURBO

SILVER

RAY · TRACING

3 · D GRAPHICS
AND ANIMATION

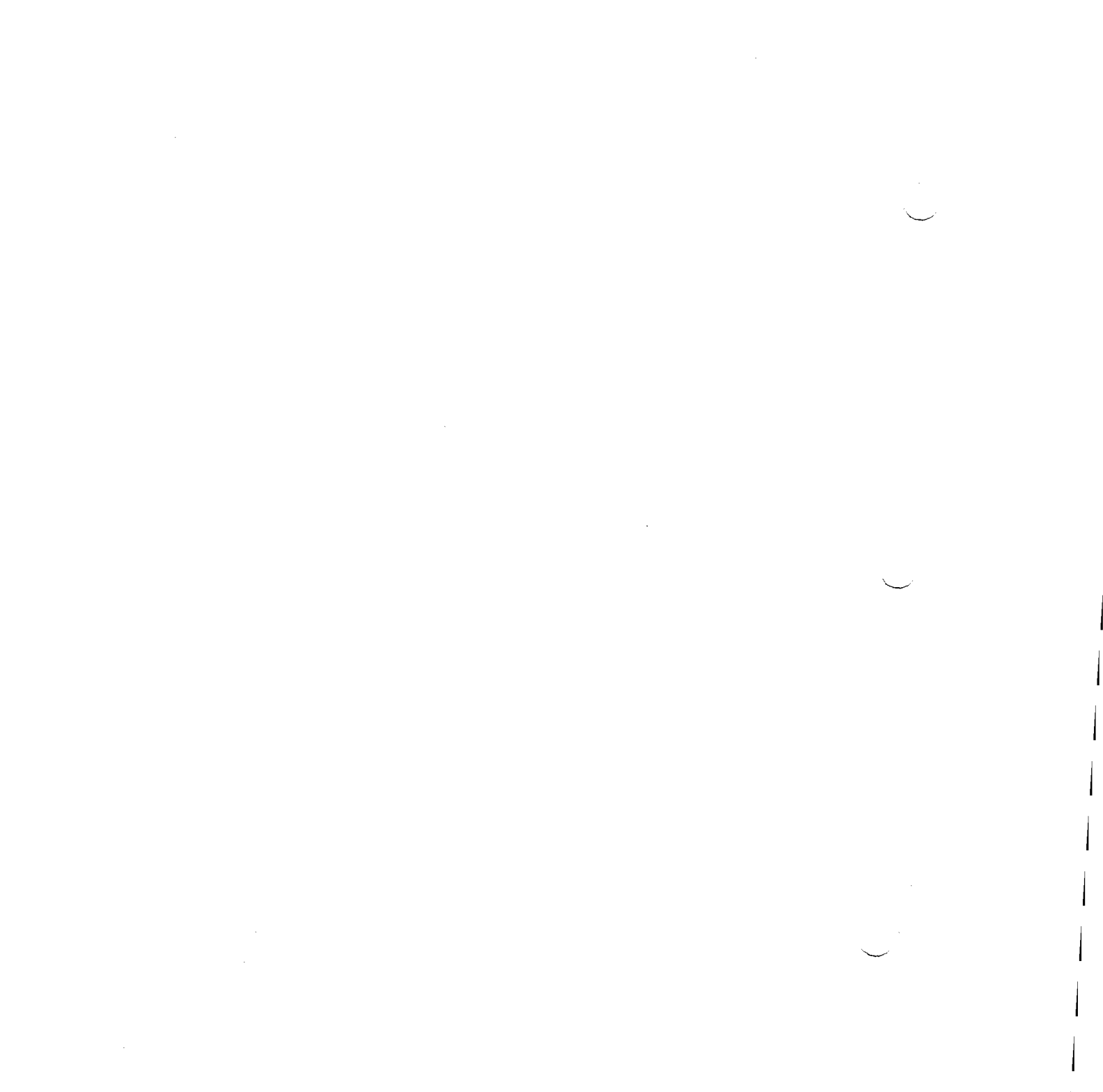AMIGA SOFTWARE

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Turbo Silver 3.0

User Manual

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Hardware Requirements:

Amiga 500,100,2000
1 megabyte of memory (minimum)
1 floppy disk drive (minimum)

Optional:
Hard disk
68020 or 68030 CPU
68881 or 68882 math coprocessor

Introduction

Welcome to Turbo Silver, the finest three-dimensional ray-tracing animation system available for your Amiga computer. Turbo Silver lets you create stunningly lifelike stills and animated sequences as well as realistic scenes that could only exist in your imagination. Among its many advantages, Turbo Silver offers you:

- seamlessly integrated Object Editor and Animation Editor
- fastest rendering time of any Amiga 3D ray-tracing program
- ultra-fast solid-modeling preview mode with shading and smoothing
- full use of HAM (hold-and-modify) mode for 4096-color ray tracing
- hierarchical object grouping and movement
- true 3D solids, thus object file compatibility with other 3D modeling programs
- object creation commands include spin and extrude as well as point-by-point and face-by-face
- powerful Undo command allows for easy experimentation as well as human error
- many object attributes include color, reflection (mirror), transparency, roughness, specular, hardness, refraction, shaded/bright, smooth/facets, blending--most applicable to parts as well as entire objects

- turbocharged animation generation
- up to eight different IFF Brushes--any image, including HAM interlace, can be wrapped around any shape
- eight different Stencils per frame--hand-drawn shapes that become solid and can take on any Silver attribute, including IFF Brush wrapping
- eight different object textures per frame--a uniform pattern with various user-definable attributes (e.g. size and color)
- up to 999 frames per animation sequence
- Virtual File storage system permits each cell to be as complex as memory allows
- super requesters permit setting and viewing of many parameters on one screen
- up to 32,000 light sources per scene
- light source can project IFF images onto other objects
- true light refraction for transparent objects (including default settings for glass, water, and crystal)
- special perturbance mode for 'broad-field' animation
- full support of CSA Turbo and work-alikes (68020 CPU and 68881 floating-point coprocessor to speed rendering times by up to 400%)
- full support of Amiga's multitasking operating system

Quick Start

As you're probably curious to see just what this program can do, here's a step-by-step mini-tutorial that lets you quickly create and render a 3D object.

1. Run Turbo. When the program starts (it looks like a film strip laid horizontally across the screen), select New from the File menu and select a drive and name for the new file. We recommend using a blank, newly formatted disk for data.

2. Click twice on the leftmost frame, number 1, in the film strip. The disk spins for a moment, then the Cell Editor Window appears. The small circle in the window is the camera. Press F10 for the right view to see that the camera is pointed forward, then press F9 to return to the front view.

3. Select Add from the Edit menu, and select Custom from the Add submenu.

4. When the Custom object requester appears, click on Cone, then close the requester by clicking on the close gadget in its upper left corner.

5. The cone should appear in the center of the window, colored orange. If the Rename requester appears simply click its close gadget. Press function key F1 and the cone turns blue.

6. Select Track from the Special menu. This keeps the camera pointed at the cone.

7. Press function key F7 to activate the Attributes requester.

8. Click on the square gadget labeled Color near the upper left corner and the large square in the requester turns white. Drag the Green and Blue slider gadgets in the requester's upper right corner all the way to the left--the large square in the requester should turn red. This makes the cone red.

9. Close the requester by clicking in the upper left corner.

10. Select Axis from the Edit menu's Add submenu. This will be our light source.

11. When the orange axis appears, close the Rename requester if present,

then press F1 once--it turns blue--and again--it turns green.

12. Click the mouse near the camera at its height or a little above, but not too near so you'll be able to see the object's shading. The axis instantly moves to where you click and turns back to blue. To reposition the axis, press F1 again (the axis turns green), then click in the new spot. This sets the light's height, but we also need to move it away from the cone.

13. Press function key F8 to switch to the top view. Press F1 to turn the blue axis green, then click to the side of the camera to reposition it, again not too close. If at any time you click away from the axis when it's blue, it will turn white and you'll need to click on it to reselect it for further operations.

14. Make sure the axis is blue. Now press F7 to invoke the Attributes requester for the axis. Click in the square gadget next to As Sun near the requester's lower left corner (an X appears in it), then close the requester.

15. We're almost ready to render the image of the cone. Exit the Cell Editor by clicking in the close box in the window's upper left corner. The disk spins for a moment, then the initial screen, which looks like a horizontal strip of film, appears. This is the Animation Editor, and its menu commands are used for rendering pictures and animations.

16. Even rendering such a simple object can take quite a while with ray tracing, so to speed it up we'll set a zone to render only a small portion of the screen. Select Set Zone from the Options Menu. Mouse coordinates are shown at the top of the screen. Click the left mouse button at 120,65 and again at 200,140.

17. To render the image, select Generate from the Display menu. A screen message constantly informs you of the progression of the image, which may not be viewed until finished. This should take several minutes.

18. When the image is completed, an asterisk appears in the lower portion of Frame 1. Make sure the frame is selected (the lettering appears white, not orange), then select Show from the Display menu.

19. In a few moments you should see a nicely shaded red cone against a black background. If not, go over the above steps carefully.

20. Click the left mouse button to return to the Animation Editor.

About This Manual

The Turbo Silver manual is divided into several parts:

Introduction
Getting Started
Gen eral Reference
Reference--Object Editor
Reference--Animation Editor
Appendices

If you've used Silver before you may wish to skip the introductory section if you're in a big hurry. But if you're not, read everything--the program has changed a **lot**!! Even if you're familiar with the basics of 3D design and animation, you should start with the Introduction and read through the entire manual at least once before using the program.

We can't impress upon you enough the importance of reading and rereading the Reference Section of this manual. Although easy to use, Turbo Silver is an advanced and complex piece of software. If you consider your time to be valuable, you owe it to yourself to learn to use the program as efficiently as possible. As friendly and ergonomic as the Amiga's Intuition interface may be, we can't possibly put every fine point of the program into the menus. And since the density of the information

contained in the reference section renders it indigestible at a single sitting, rereading the material is important.

What is Turbo Silver?

You're probably familiar with graphics programs such as Deluxe Paint II that let you paint with color directly on the computer screen. Even if you're not a major drawing talent these programs give you many tools with which to create interesting pictures. If you are a skilled artist, however, you can use paint programs to create realistic-looking scenes, and with a lot of work, even photograph-like images. Turbo Silver is a different kind of graphics program that does the hard work involved in creating a 3D scene for you. To create an image, you first use a 3D editor to place wireframe objects in a three-dimensional scene, describe various attributes of the objects and the general scene, and then let the program go to work to generate the final image in a process called 'rendering'.

Turbo Silver's 3D Object Editor lets you create just about any three-dimensional shape you can think of, and even a few you might not have. Most of Turbo Silver's objects are composed of a number of connected triangular faces, each of whose corners is called a 'point'. You can create custom objects by adding points anywhere in the 3D space, then connecting them in triangular faces. You can create round objects by spinning points about a central axis, and you can extrude flat shapes into solid ones. A special 'Extrude Path' command lets you extrude objects along complicated paths. You can move or rotate grouped or individual objects as well as points and faces. You can apply any of a generous assortment of attributes and properties as well to objects, groups, and faces. You can wrap IFF image files around any shape and use special 2D objects called Stencils that can be created with any paint program.

Turbo Silver's Animation Editor is what you see when you first start the program--it looks like a film strip laid horizontally across the screen. The Animation Editor lets you manipulate entire cells, including all objects and properties contained therein. You can cut, copy, combine and paste cells, and make new cells containing copies of an existing cell. To edit an individual frame of the animation you just click on the corresponding frame with the mouse and you're transferred to the Object Editor, where you can create and manipulate objects. Once you've set up a scenario in a cell, you can animate it automatically across any number of frames with the Story command.
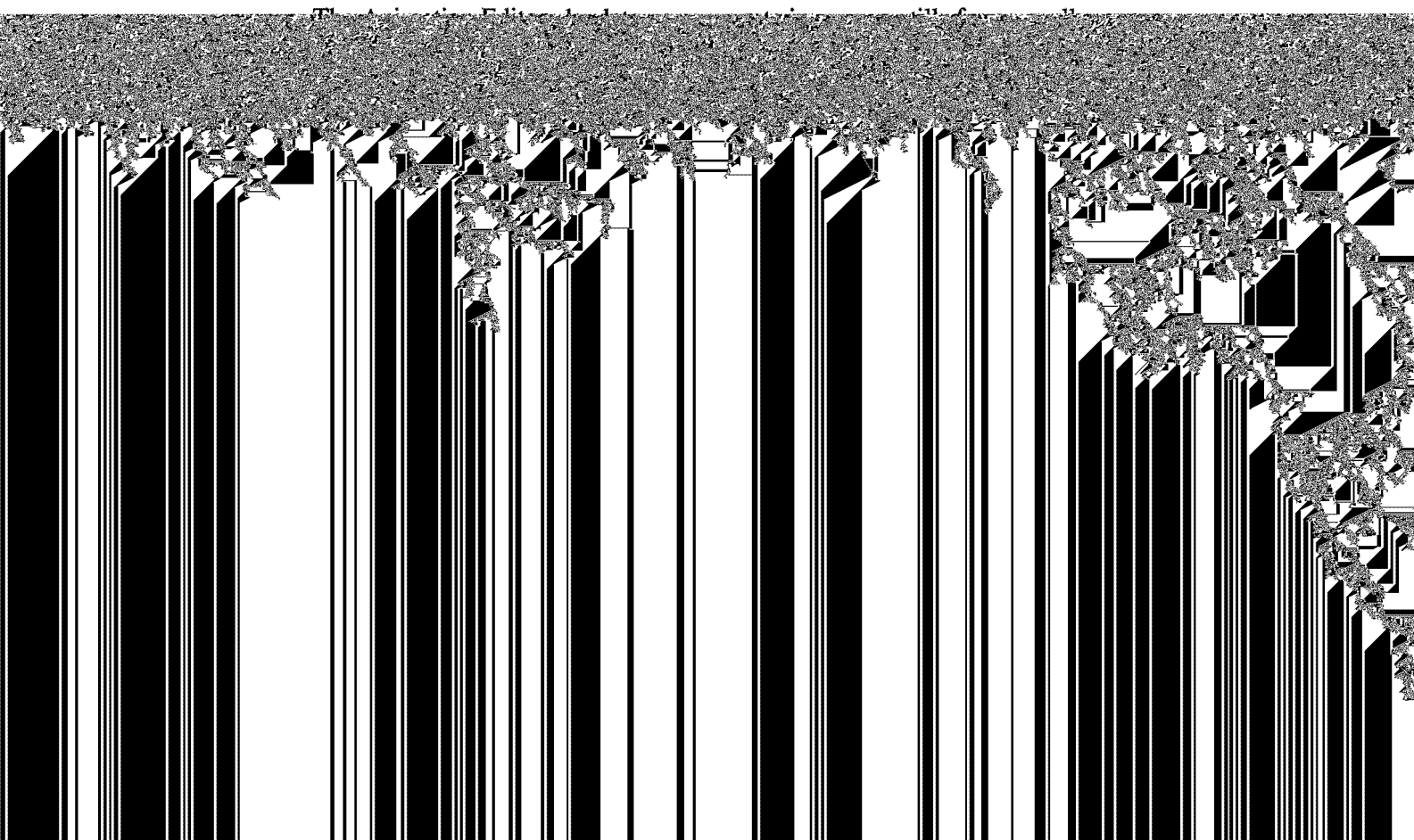
tracing, and Turbo Silver pushes this advanced but affordable new
technology to its limit.

Getting Started

Turbo Silver isn't copy-protected, so first duplicate the program disk
using your standard disk copy procedure (see your Amiga owner's manual
for details). Store the original Turbo Silver disk in a safe place and use
the copy to work with. If you have a hard disk you may wish to install the
program on it by simply copying the files over--we recommend creating a
new subdirectory for Turbo Silver and its files.

Please remember that we've worked hard to create this program and
depend upon its sale and legal usage for our livelihood. Impulse won't
insult your intelligence by overstating the fact that giving away or selling
copies of commercial software you've bought is illegal, so please don't do
it. Each copy of Turbo Silver that Impulse sends out has a unique
traceable imbedded code which is indelibly retained in any copies you
make. Remember that Turbo Silver is protected against loss of media
integrity with a lifetime warranty. We protect you--please protect us as
well.

Running the Program

Start up your system with Kickstart and/or Workbench versions 1.2 or
higher according to your owner's manual.

To start using Turbo Silver, place the working copy in any drive. When
the Turbo Silver disk icon appears open it, then open the **Turbo** program
icon that appears in the window. If you have floating-point math
coprocessor (68881 or 68882 or equivalent) installed in your system run
Turbo.fp instead, also supplied on your program disk. To start Turbo
Silver from the CLI, type Turbo or Turbo.fp from the command prompt

(assuming you've set the current directory to the one containing the Turbo Silver program).

When the program begins you're placed in Turbo Silver's Animation Editor, which looks like a horizontal film strip of eight frames, with a ninth near the bottom of the screen between two slider gadgets. To begin working on an animation you must use the New or Open command from the file menu. More about this shortly, but first we'll discuss some important details.

NOTE: Remember that Turbo Silver requires at least one megabyte of memory to run. If you attempt to run the program on an Amiga that contains less, you'll encounter a fatal software error.

Disk Usage and Memory Usage

Once loaded, Turbo Silver doesn't need to access the program disk any more. This is of great benefit to floppy-disk users, who can use all of a blank disk for data without having to swap the program disk back in at various times. However, Turbo Silver lets you store different types of data in different directories, so more disk storage permits you correspondingly longer animations.

Silver uses a Virtual File storage scheme to maximize memory and let you create as complicated objects as possible in each cell. When you enter a cell from the Animation Editor its contents are loaded from a temporary file, and when you edit from the Object Editor workspace the cell is saved to a temporary file on disk. You can set the drive and directory (path) used for this operation with the Cells item in the Animation Editor's Scene menu. Despite this automatic backup system you **must** use the Save command to ensure that edited cells are safely stored on disk for future reloading.

Although Silver can use all the memory available in your system for each cell, there's no reliable way to predict memory usage in specific situations. All objects use memory, so the more complex each of your objects is, the fewer you'll be permitted to create. Remember that spinning and extruding objects with many points can add tremendously to their complexity. Another point to keep in mind is that Silver uses a special technique while rendering that 'spreads out' your scene in any available memory to generate it significantly more quickly. In creating animation sequences Turbo Silver uses a special memory-saving technique called delta compression in which only the pixels that change from frame to frame are saved. Thus for example in a case in which a 67-kilobyte frame is followed by one in which there is relatively little change, the second might require only 30K of storage. This allows you to create longer animations than would fit in memory without the benefit of compression. However, you must still be wary of creating animations that are larger in size than the amount of memory in your computer--you won't be able to load and display them.

Turbo Silver Conventions

Hot Keys

When you're first learning to use a program, it's of great benefit to be able to access any of the relatively unfamiliar commands with a mouse pointer and pull-down menus. Once you start to feel at home, however, you sometimes need to work a little more quickly. So Turbo Silver gives you 'Hot Key' keyboard alternatives to most menu commands, listed to the right of the command in the menu. In all cases, to use a Hot Key first press and hold the right Amiga key (to the immediate right of the space bar), then press the second key shown to the extreme right of the menu item (e.g. to delete a selected object or cell--Right Amiga-D-- hold down

the right Amiga key and press the D key). All of Turbo Silver's Hot Keys
are listed on the enclosed Quick Reference Sheet.

We recommend that one of the first Turbo Silver Hot Keys you learn is
the powerful Undo command (Right Amiga-U), available in both the
object and Animation Editors. It always returns you to the condition
before the last command.

Special keys used in the object editor are function keys F1, which turns an
orange 'selected' object blue, or if the object is already blue it is 'marked'
and turns green, ready for repositioning--click the mouse at the new spot.
The F2 key deselects the last picked object in Multi mode. Also, the four
arrow keys let you scroll the Object Editor window in the indicated
direction.

List of Special Keys

Key   Function
F1   Picks selected group, object, face, or point   (same as Add
Select from Pick Menu)
F2   Removes ('un-picks') last object, face or point picked in Multi
mode.
F4   Invokes Global Settings requester
F5   Invokes Camera Settings requester
F6   Invokes Transformations requester (if object is picked)
F7   Invokes Attributes requester (if object is picked)
F8   Top View
F9   Front View
F10   Right View
S   When rendered frame is being viewed with Show command,
this key saves the image in IFF format.
Left Shift - When held down in conjunction with mouse or F1-key
selection, allows picking multiple objects, points, edges, or faces.

You can set function keys to invoke any Object Editor menu command
with the configuration file. See Appendix A for details.

Menus and Submenus

Many of Turbo Silver's menu items have sub-menus, and as in most such
cases navigation of these can be a bit tricky at first. When using the
mouse to access submenus, it's best to drag the mouse all the way to the
right side of that menu sub-item. As with any new Amiga program, we
recommend that you test drive the mouse through the various menu items
to get a feel for the layout.

Mouse Usage

Mouse usage in Silver adheres to the Intuition standard used by many
Amiga programs. To access the drop-down menus, hold down the right
mouse button and move the pointer to the top of the screen. Use the left
mouse button to select and access frames when in the Animation Editor,
and to manipulate objects when in the Object Editor. Whenever this
manual uses the phrase 'click on' something, it means to position the
mouse cursor over the object and press the left button, then release it. On
the other hand, 'click and hold' means to keep the left mouse button
depressed, the way you keep the right mouse button pressed when you
navigate the menus.

Entering Numeric Data in Silver - Using the Requesters

Turbo Silver uses a lot of numbers--for color, position, rotation, size, and
many other settings. Most requesters let you use two or three different
methods for entering values: directly from the keyboard; by clicking and
holding on up/down value adjustment gadgets (they look like small
arrowheads) next to the number; or by clicking and dragging the value
slider left or right. When you hold the mouse button down on the

up/down value adjustment gadget for more than a few seconds the rate of change gradually accelerates. The Transformations requester doesn't use sliders, and some smaller requesters require you to enter numbers directly.

IMPORTANT NOTE: Whenever you use the computer keyboard to enter text or numeric data into a Silver requester, you **must** press the Return (or Enter) key in order for the new data to be registered. In most requesters, pressing Return also takes you to the next field, unless you're in the last one in the form.

File Requester

If you've ever used an Amiga program that saves and/or loads files you understand how Turbo Silver's file requester works. Below is an illustration:
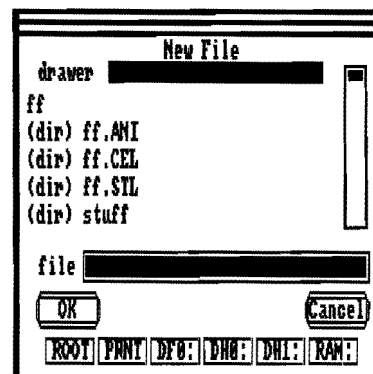
File Requester

Note that the bottom row (or rows) of gadgets in the file requester shows all drives on line in your system. Also, the two leftmost buttons in the top row labeled ROOT and PRNT are for maneuvering upward through disk directories. Click on the ROOT button from within any subdirectory to

return to the highest, or root level. PRNT stands for Parent; click on this
button to return to the subdirectory immediately above the current one, as
specified in the DRAWER line. In hard disk usage, this line can be blank
even though you're currently viewing a subdirectory, in which case the
PRNT gadget has no effect. The window above the drive buttons shows a
list of all files and directories in the current directory. Note that when
using the Open command, only Silver Script files and directories appear in
the file list, and the .SCR extenders don't appear. Click on any other
gadget to list files on that drive. If there are more files than can fit in the
window, use the slider to the window's right to scroll the others into view
(click on and slide the dark bar vertically, or click immediately above or
below it).

To see the files inside a directory, click on the directory name in the file
list window. You can also type in a path name after first clicking in the
box to the right of the word DRAWER above the text window. Once
you've found the name of your file click on it, then on the OK gadget to
the lower left of the window. If you're using the New command you'll
need to click on the box to the right of FILE and type in a new file name.
To escape the file command without changing anything simply click on
the Cancel gadget.

Reference Section

The 3D World of Turbo Silver - An Overview

We've got a slight problem to overcome here. You see, humans and computers have absolutely no problem dealing with three- dimensional worlds. Unfortunately, we've yet to develop effective 3D displays for our computers, and so must command them using interfaces based on the flat displays currently in use. Alas, it's most difficult to effectively represent a 3D world on a 2D display, and to quickly show changes in the world or display.

Turbo Silver's Object Editor uses a three-window display (one window at a time) to show the scene you're working on from three different angles--above, from the front, and from the right side. These in combination with the wire-frame mode of display used gives you a reasonable idea of where things are and how they're positioned. Among the advantages of seeing only one view at a time are fewer confusing details for you and less for the program to redraw when you change something, resulting in faster and more responsive editing.

In Plane Geometry you learned about the X and Y axes of the Cartesian Coordinate system which could be used in mathematics to make two-dimensional graphs. In 3D computer graphics a third axis is added to be able to describe an object's depth as well as its height and width. Each point in the Turbo Silver 3D world can be referenced as a unique set of coordinates (X,Y,Z) on a three-axis Cartesian reference system. See the illustration on the next page:

```
                    Z Axis
                   +1000              +1000

-1000 ____ X Axis _____ +1000


        Y Axis
          -1000
                       -1000
```
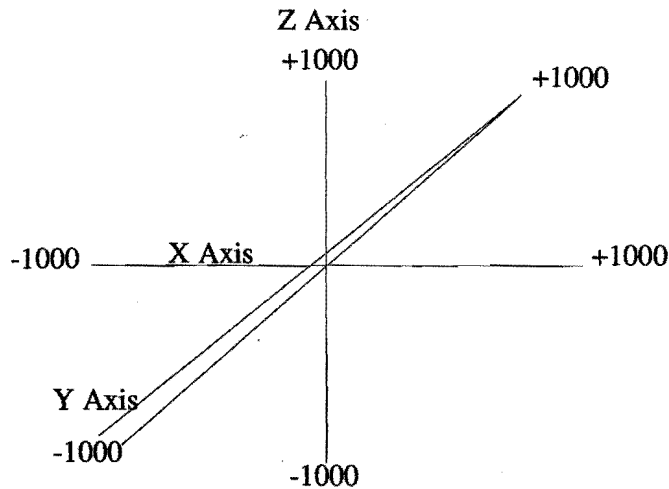
x,y,z axes showing +/- 1000 extent

Thus the X coordinate describe's a points horizontal position, the Y
coordinate its depth or 'in-out' position, and the Z coordinate its vertical
position. Note that the center of the Turbo Silver 3D world is at 0,0,0, and
its extent is 1000 units in any direction. This means that all realistic
coordinates must fall in the range (-1000,-1000,-1000) to
(1000,1000,1000).

Each object in Silver (except the special sphere and surface objects--see
Edit Add Sphere and Edit Add Surface below) consists of a set of points
in space connected in triangular faces and/or edges. Objects can be
grouped, and you can manipulate groups, objects and sets of independent
objects, sets of points and faces in a variety of ways all described in detail
below.

As an example and to help you start thinking in these terms, imagine an object at coordinates 0,0,0 illuminated by a light source at -80,-90,100. In this case the light source is eighty units to the left of the object, ninety units in front of it, and 100 units above it.

In addition to describing objects' shape and location, the three- axis system is used to describe rotational movement. Turbo Silver can rotate groups, objects, faces and points in one-degree increments about any or all of the three axes.

Since Silver's wireframe editor lets you move groups, objects, points and faces interactively, you won't often need to deal directly with location coordinates. But should you need to use the Translate, Rotate, or Scale commands, it's important to know the difference between local and world axes. Every object in Silver has a small axis, or set of X, Y, and Z axes, associated with it that's used as a control and orientation point. When an object is first created, its axis is aligned with the Silver 'world' axis--that is, as seen from the front X is left and right, Y is in and out and Z is up and down. But when it's rotated it's no longer aligned, and you get different results from performing the above transformations on a local or world basis. Silver performs translation, rotation, and scaling in the direction of any or all of the three axes. Transformations on the local basis take place in the direction of the object or group's axis. On the other hand, the world's axis never changes. This flexibility gives you complete control performing transformations.

HINT: Since you can rotate, translate, and scale objects on their own axes, you might want to change an object's axis on occasion. For example, you can rotate an object on any of its vertices by positioning its axis there. To do this, pick the object, activate Pick Face mode, pick any face, Mark it, then click on the new location for the axis (you'll find further explanation in the Reference Section below). Do this from all three views for precise interactive placement of the axis. By the way, to

perform actual transformations on objects' faces, you must use Point
mode, picking all the faces point by point.

Light in Turbo Silver's 3D World

Turbo Silver uses two types of light--point source and broad source.
Another name for broad source light is ambient, which means surrounding
on all sides. Ambient light doesn't come from anywhere in particular, but
illuminates all things evenly. Your only control over ambient light is its
overall level. As ambient light tends to 'wash' out images and can lead to
a bland look, we recommend minimal usage, especially since Silver
allows you as many as 32,000 point-source lights. You set ambient light
in the Global Settings requester.

Any object in Silver can act as a point-source type of light, which has two
settings--As Sun or As Lamp. The latter is the more conventional setting
in that it illuminates objects in proportion to their distance from it--the
closer they are, the more brightly lit. The As Sun setting, however,
illuminates all objects with the same brightness no matter how distant or
close they are to the source. Also, the Shaded/Bright setting for light
sources determines whether or not it casts shadows. You can set any
point-source light's position as well as its brightness. In addition, you can
assign light positions to paths to create moving light sources during
animations. If you load an IFF brush onto an axis, then set it as a light
source, it projects the picture onto objects it illuminates!

The Turbo Silver Camera

The camera (the small circle near the center of the window) is the only object present when you enter the cell editor for a new cell. It's an object like any other in the Turbo Silver 3D world, and the current scene is always rendered from the camera's viewpoint. Of course the camera can be positioned at any point in the 3D world, and can be aimed at any other point. In addition, you can assign the camera position to paths to create a moving vantage point during animations. Automatic tracking of any object is a handy option but aim can also be set manually for special effects. For realistic photograph-like results you can also set the camera's focal length from extra-wide-angle to super-telephoto.

Using the Program

Turbo Silver uses two modules--the Animation Editor and the Object Editor. When you first begin using the program you're placed in the Animation Editor, which resembles a film strip laid horizontally across the screen. From here you can edit cells or groups of cells, access the Object Editor for any cell, render cells' contents as still images, and create animations.

Animation Concepts

To understand how to use Turbo Silver it's necessary to know the difference between the terms cell and frame. A cell contains all the information necessary to create a single frame in a Turbo Silver animation. That is, a cell contains 3D objects and their attributes, IFF brushes and stencils as well as global attributes for that frame. The term frame in Silver usually refers to the final image rendered from a cell's contents, plust that cell. The longest process in Turbo Silver involves rendering a frame from a cell's contents. But once rendered, you can

re-use a frame in an animation sequence as many times as you like without
needing to render it again by simply replicating the frame.

Entering the Object Editor

Although the program begins in the Animation Editor, most interaction
takes place in the Object Editor. Whenever you load Turbo Silver, your
first action (after setting the graphic mode-see the Animation Editor
Reference introduction) should be to use the File menu to Load an
existing file or create a New one. Then, to enter the Object Editor for any
frame, just click twice on it. The first click selects the frame, turning its
text from orange to white (assuming default colors), and the second makes
a cell for that frame if one doesn't exist, then opens the Object Editor for
the cell. When this happens, Silver's Virtual File storage scheme creates a
slight pause while the cell's previous contents, if any, are loaded from
disk. Similarly, exiting the object editor saves the most recent results of
editing to disk automatically. Since most work is done in the Object
Editor, the manual discusses this section of the program first.

Object Editor;
Basic Operation

When you first enter the Object Editor in an empty cell, the screen looks
like this:
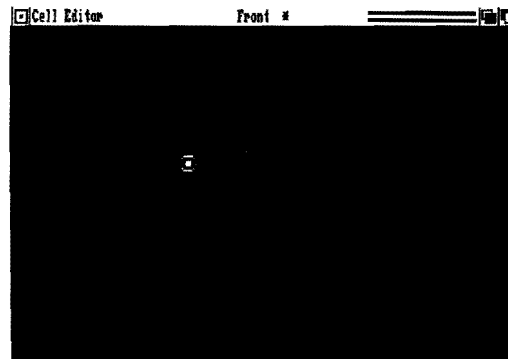
Object Editor Screen

The small circle near the center of the window is the camera and the view
is from the front, as noted in the information bar above the window.
Options available here are many, starting with the ability to create
three-dimensional objects of just about any shape. You can move them,
rotate and resize them, assign attributes such as color, reflectivity and
transparency to parts or all of an object. You can also create animation
sequences quickly and automatically. All these and more are explained in
this section.

Picking and Selecting Objects

Objects normally appear in the window as white wireframe constructs on
a light blue background, each with its own small XYZ axis showing its
orientation. To perform operations such as translation, rotation, resizing,
and applying attributes such as color and reflectivity, you must first
choose the pertinent groups, objects, faces, or points in a process called
Picking, as in Pick menu. The default or startup Pick mode is
Group--click on an axis origin of a parent object to pick the associated
group. You can also pick child and independent objects in Group mode.
Once picked, objects and groups turn **blue** in color. At this point to
manipulate parts of an object you'd select Point or Face from the Pick
menu. To perform **physical transformations** on parts of objects use Pick
Point (Right Amiga-3). However, to apply **attributes** such as color,
transparency, and reflectivity to parts of objects, use Pick Face (Right
Amiga-4). The color **red** is used to indicate picked points or faces on an
object. As a special case, to reposition an object's axis, use Pick Face and
pick any face, then use the Position command.

Once an object is picked (blue for objects, red for points) you can
reposition it interactively by clicking again on the axis (for objects) or
point. Or simply press the F1 function key. In any case the entire object
turns **green**. Click anywhere on the screen and the object or point is

repositioned there. This also works for multiple objects or points (see
Multi Mode below).

There is a fourth special color used for objects and groups--when first
placed, or selected via the Next command (see Special Menu below), they
turn **orange**, whereupon you can pick them by pressing the F1 key, which
turns them **blue**. Multi mode also works here--hold down the left Shift
key when pressing F1 and you can pick multiple objects. When using the
Next or similar command in Point mode points turn **light blue** and in Face
or Edge mode faces and edges turn **green**. Finally, objects clicked on
twice or picked, then activated with the Mark command (see Special
Menu below) turn **green** to indicate being ready for interactive
repositioning. At this point you need simply click on a new position in
the window and the object is repositioned automatically. For moving
parts of objects (Pick Point) or objects' axes (Pick Face), the **entire** object
turns green when you mark the points or faces, but only the points or axes
move when you perform the repositioning.

You can also use menu/keyboard commands to pick objects (Special
menu Home, Next, and Last commands and function key F1), and you can
search for and select objects by names you give them (Special Menu Find
command). For further information consult the Object Editor reference
below. The other Pick modes are Object, Point, and Face. You can pick
any number of unconnected objects, points, or faces by holding down the
left Shift key as you click ('Multi' pick mode). You can then Mark them
for movement by continuing to hold down the left Shift key and clicking
on one of the picked (red) points. The entire object turns green, but only
the picked points (which remain red) move when you click on a new
location in the editor window.

NOTE: Certain faces in spun or extruded objects cannot be picked by
clicking on any of the associated points. In such a case you must use the
Right Amiga key in conjunction with the N, B, and H keys (for Next, Last

or Back, and Home, the first object added). In many cases you can
quickly and easily pick a 'stripe' of faces on a spun object with alternate
presses of Right Amiga-N (or B) and Left Shift-F1.

Multi Mode

In any Pick mode, you can use the left Shift key to activate Multi mode,
shown at the top of the screen. If you continue holding down the left Shift
key as you click on objects, each turns blue (or red) in turn while all
others previously clicked on remain so. Then any transformation applies
to all picked. When several objects, faces, or points have been picked
using Multi mode, you can unpick each in reverse order of their original
selection with repeated presses of the F2 function key.

Color chart

Selected, ready to Pick:

Object, Group	Orange
Edge,Face	Green
Point	Light Blue

Picked, ready to Mark or transform:

Object, Group	Blue
Edge,Face, Point	Red

Marked, ready to move:

Object, Group,	
Edge,Point, Face	Green (Group or entire object)

Note: you can change any or all of these color assignments as well as
various other Silver startup conditions. See Appendix A, "The Silver
Configuration File" for further information. Also, moving an edge or face
results only in movement of the axis.

Edit Menu

This menu is used for basic object creation as well as standard editing
procedures. Most objects in Turbo Silver are composed of triangular
faces, but two of the shapes in the Add menu, sphere and surface, are 3D
unfaceted 'primitives' which render quickly. All other objects consist of
an axis (actually a set of small X,Y, and Z axes) and a set of connected
faces. These types of objects, called 'faceted', can be edited
point-by-point for physical remolding or face-by-face to change attributes
for different parts of an object. All Edit menu commands, as well as most
others in the editor can be reversed immediately after invocation by use of
the Undo command (Right Amiga-U).

Add SubMenu

This submenu lists commands used to add new objects, points and faces to
the editor workspace. Newly added objects are always located at 0,0,0,
the center of the workspace, and are colored orange. This means that you
can pick them by pressing function key F1 (they turn blue), then prepare
them for interactive repositioning by pressing F1 again or Right Amiga-M
(they turn green). Then click on the new location to perform the
repositioning.

IMPORTANT NOTE: Turbo Silver doesn't automatically place a light
source in the three-dimensional workspace, so make sure you do or else
your objects will be invisible. We recommend you make it a habit to add
and position an axis and set it to be a light source when first editing any
new cell. See Attributes in the Settings menu section below for details on
setting an object to be a light source.

Automatic Name Requesters

Silver is set up to request names for all new objects created with Add
submenu commands. We recommend that you give all objects unique
names whenever using the Story or Track commands. After selecting the
type of object to add, the Rename requester appears. To easily delete the
existing default object name, press Right Amiga-X, or use the backspace
and Delete keys. Then type a new name in upper or lower case letters,
and press Return--the name is converted to all upper case. Don't forget to
press Return, or the name won't be registered. You can rename existing
objects with the Attributes requester. You can disable the automatic
Rename feature by editing the SILVER.CFG file--see Appendix A.

There are a number of different types of objects in Turbo Silver:

Sphere

This 3D primitive is a perfect surface of revolution, which eliminates any
'faceted' appearance no matter how close the observer. Although you
can't manipulate individual points, all other standard Turbo Silver
transformations, including IFF brush wrapping, are available with the
sphere primitive. As the sphere primitive appears simply as a circle in the
Object Editor window, it helps keep the workspace uncluttered and
minimizes redraw time.

Incidentally, if you're familiar with the original (non-Turbo) Silver, the
Bounding object type no longer exists. Turbo Silver renders more quickly
without using bounding objects than previous versions of Silver rendered
with them.

Stencil

A stencil is a special type of object in Turbo Silver--a drawing that becomes solid! A stencil starts out as a one-bitplane (two-color) drawing created in a paint program such as Impulse, Inc.'s new Diamond or Deluxe Paint II. When rendered in Turbo Silver the background color (usually black) is transparent while the foreground color behaves like a standard Turbo Silver object. This means that you can apply such attributes as color, transparency, and reflectivity--you can even load an IFF brush onto the stencil! For further information refer to the section describing the Stencils menu below.

Axis

The Add Axis command is the starting point for building a customized object point-by-point and face-by-face. After adding and picking an axis, you can add points and faces anywhere in the 3D space. You can also spin a set of points and extrude a set of faces to make relatively complex objects easily and with precision.

The default configuration file SILVER.CFG that comes on your program disk provides you with an easy two-key alternative to the Add Axis menu command. Just press and release the Esc key, then press and release function key F2. You can set other Object Editor menu commands to the function keys by editing the configuration file. See Appendix A for details.

The object called Axis in Turbo Silver is actually a miniature set of X,Y, and Z axes with a common origin, called the 'hot spot'. All objects contain an axis. One method of picking objects for movement or setting attributes is to click on the hot spot. The axis itself never appears in the final rendered image.

The axis also acts as a control point for wrapping IFF brushes (images)
onto 3D objects. By loading a brush onto an axis, then grouping the axis
as a parent to an object, you can use the axis to control the image's size,
angle, and various other aspects in relation to the object by performing
transformations on the axis. For further explanation see the section on the
Brush menu below.

There are lots of other possible uses for the axis object--your imagination
is the only limit! Think of the axis as an invisible object that can have any
property available to Turbo Silver objects. For this reason the axis makes
an excellent light source. Or consider an example in which you wish to
show a group of objects orbiting a sphere. By simply grouping the set of
circling objects to the axis, with the axis as parent object, you can rotate
the group about the axis with one setting. Without the axis describing this
type of motion with a group of objects would be difficult at best. An axis
also serves well as a Track object (see Special menu) for an invisible point
of reference.

Custom

Selecting Custom from the Add submenu produces a movable requestor
displaying Turbo Silver's mini-library of built-in faceted shapes. Select
any of the six button gadgets for:

Sphere -- a ball-shaped object
Torus -- a donut shaped object
Cone -- tapers up from a disk to a point, has no bottom
Tube -- a hollow column
Extrude -- an extruded disk, or solid column
Disk -- a flat but solid circle

and the name of the object appears next to the words 'Choice is'. Then set

the dimensions by clicking in the corresponding box and typing in a new value. All objects are created by spinning. The dimensions are as follows:

Major Size -- radius of sphere or torus, height of cone, tube, or extrude (no effect on disk)

Minor Size -- cross section of torus ring, or radius or one-half the X-axis dimension of cone, tube, extrude, or disk (no effect on sphere)

Divisions -- number of line segments in object's circumference (e.g. four for square, five for pentagon, more for rounder objects--sphere always doubles this number)

Keep in mind that the more divisions, the longer an object takes to render. Object creation is always a compromise between good-looking objects and time requirements.

Finally, click on the close gadget in the requester's upper left corner to place the new shape at coordinates 0,0,0 in the editor workspace.

Once you've created a custom shape you can edit it point-by-point, resize it, spin or extrude or build on it, or even split it! Read on to find out about these and many other options.

Surface

This primitive (non-faceted) rectangle is provided so that you can include a flat plane or wall in your animations without having to contruct one. Though you can't edit it point-by-point, you can resize it, load IFF brushes onto it, and perform other standard Group and Attribute menu operations with this object. If you want a checkered ground, the easiest way is to load the Chex texture (included with your program disk) onto

the surface, or you can load a checkered IFF image. You can use as many
surfaces in a scene as you like.

Ground

The ground is a non-resizable horizontal surface that extends to the limits
of Silver's 3D universe. Grounds can be assigned attributes including
brushes and patterns, and they can be repositioned vertically (on the Z
axis) only. You can use several grounds.

Point (Right Amiga-6)

Use points to create paths for object motions or extrusions, or outlines for
spun objects, or creating objects from scratch. The basic procedure for
using Add Point is:

• First place an axis (or other object)

• Pick it (so it turns dark blue)

• Add points

• Connect them with Add Edge (Right Amiga-7) or Add Face
(Right-Amiga-8)

All points placed before selecting a different command become part of
that object. After selecting Add Point click in the Object Editor window
anywhere you wish to place points. You can change the window to
different views during this process. You must add edges and/or faces for
the object to be useful.

NOTE: Normally when you add a new point to an object, you can only
position the cursor in the two dimensions permitted by the current view

(e.g. in the X and Z dimensions from the Front view), while the point's position on the in/out axis (Y from Front view) is always 0. However, with the Set Depth command from the View menu (see below) you can position points anywhere in Silver's world without having to change views.

IMPORTANT: You can proceed directly from this command to Add Edge or Add Face (see below) to further work on an object, but you must return to Pick Object mode (Right Amiga-2) before selecting any other command, otherwise you'll remain in Add Point mode.

Edge (Right Amiga-7)

An edge is a line connecting two points. Edges are used in Silver primarily for creating motion paths as well as spun and extruded object outlines, rather than for creating objects from scratch.

First use Add Axis, then Add Point to add two or more points to the axis (see above). Then after selecting Add Edge, click on each point to connect in succession. A green line connects the last added edge, while all others are green. You need click only once on each point in a path or outline when connecting them with Add Edge. To connect points in a nonlinear fashion, exit Add Edge (e.g. press Right Amiga-2 for Pick Object), then return to Add Edge and start again at a new point.

NOTE: After adding edges to an object, you **must** return to Pick Object mode (Right Amiga-2) before selecting another command such as Mold.

Face (Right Amiga-8)

After adding at least three points to an axis (see Add Point above) you can connect them into triangular faces with this command. Before selecting Add Face you must pick an Axis with at least three associated

points--when picked the Axis turns dark blue. Then, after selecting the
Add Face command, click on three different points in succession--you
needn't use Multi mode--to connect them with red lines, which show that
the new face is picked. Continue the process with groups of three points.
To quit, select Pick Object (Right Amiga-2).

Faces are useful for extruded objects with closed ends, or simply for
building objects from scratch. When building a closed end for an
extruded object, be sure not to leave any holes or unexpected results may
occur.

All (Right Amiga-A)

When editing points or faces in an object (see Pick Menu below) use this
command to pick all points or faces in the object. You can then unpick
particular points or faces by using the F2 function key in combination
with Next, Last and Home commmands in the Special menu.

Copy (Right Amiga-C)

The copy command places an identical copy of all picked groups or
objects in the Paste buffer, ready for duplication. Use the Paste command
below to clone copied groups or objects (but not points) back to the
workspace at the same place from which they were copied. When you use
the Copy command the previous contents of the Paste buffer, if any, are
erased.

Cut (Right Amiga-X)

This removes any picked group, objects, or points from the current Object
Editor workspace, copying groups and objects into an invisible Paste
buffer. Cut points aren't copied into the buffer, so any previously cut (or
copied) objects remain there. Use the Paste command below to restore cut

groups or objects (but not points) to the workspace in the same place from which they were cut. When you use the Cut command the previous contents of the Paste buffer, if any, are erased.

Paste (Right Amiga-P)

Makes a copy of the contents of the Paste buffer (see Copy and Cut above) at the location from which they were cut or copied. Use repeatedly to make multiple copies of an object or group.

A newly pasted group or object first appears as orange. This means you can reposition it immediately with this simple procedure:

1. Press the F1 key to pick the object or group--it turns dark blue.

2. Press F1 again to 'mark' the object, making it ready for relocating--the object turns green.

3. Position the mouse pointer in the window at the new location and click the left mouse button--the object moves there.

If you're using the Story or Target commands we recommend renaming pasted copies of objects with the Attributes requester to avoid confusing the program.

Delete (Right Amiga-D)

Deletes any picked groups, objects, faces, or points. Use Undo to restore the most recently deleted objects.

Erase (Right Amiga-E)

Erase is a quick way to clear the entire workspace, as it deletes all objects and their properties whether picked or not. If used immediately after

Erase, the Undo command can restore the contents of the editor
workspace intact. Erase does not alter Global settings (see Global settings
requester below).

If you're in Pick Face or Pick Object mode, Erase deletes all picked
objects' faces or points. In the latter case only the axis remains, but in the
former all points remain, but no faces.

Join (Right Amiga-J)

You can join together any number of objects or points irreversibly using
this command. Pick all objects after any necessary alignment, then press
and hold the Right Amiga key while pressing the J key or select this Edit
menu item to join the objects. See the section above entitled Selecting
Objects for further details on picking multiple objects.

The Join command is also useful for resolving multiple points, which
comes in particularly handy when importing 3D objects from programs
such as Sculpt 3D, VideoScape 3D, or Forms in Flight. Some of these
programs' Object Editors attach an unnecessarily large number of points
to a single intersection of triangular faces, which can increase Turbo
Silver's rendering time. In order to minimize rendering times use the Join
command to eliminate extra vertices in imported objects.

You can also use Join to 'weld' two separate objects into one, whether
they're touching or not. All points and faces are retained, and a single
axis remains at the heart of the first object picked. Remember--the Join
command is permanent. To combine objects temporarily, use the Group
command.

Split (Right Amiga-Z)

The Split command lets you divide a faceted object along a connected
circumference of edges. First pick the object to split so it turns blue.

Then press Right Amiga-5 or select Edge from the Pick menu and pick a
line of connected edges that go complete around any part of the object.
Hold down the left Shift key (for Multi Mode) as you use the mouse or the
Next and Last commands (Right Amiga N and B) to pick the edges, which
turn red as they're picked. Then activate the Split command. If the object
can't be split, a requester appears. Try picking a different line of edges if
this happens.

Group (Right Amiga-G)

By grouping several objects you can apply single movement commands to
the entire group instead of having to issue separate instructions to each
object. This can simplify production of complex animations
tremendously. Grouping is also useful in the application of IFF image
files to Turbo Silver objects (see Brush Menu below). Grouping is also
useful in applying properties of one object to many (see Cluster).
Grouped objects can still be manipulated independently in Pick Object
mode (see Pick Menu).

To group two or more objects, use Multi mode (hold down the left Shift
key) to pick all objects **starting with the parent object**. The parent
object's axis is used to pick and manipulate the group. All subsequent
objects on which you shift-click are its direct children.

This relationship is shown graphically with purple lines when, after
picking the last child, you select the Group command from the Edit menu.
A line emanates from the parent to each child, and remains until they're
ungrouped. You can group other objects to parents or children of grouped
objects.

To manipulate a group, make sure you're in Pick Group mode, and click
on the parent object's axis to pick all objects in the group. You can
manipulate child objects independently while in Pick Group mode, and

parent objects independently in Pick Object mode. To pass on attributes (except Color, Reflect, and Filter) from a parent object to its children, use the Cluster command (see Special menu).

UnGroup (Right Amiga-Y)

After picking a group, remove its objects' interdependence as well as their chains (purple lines) with the Ungroup command.

Undo (Right Amiga-U)

The Undo command reverses the effects of the last command used. It's one of Silver's most useful, and allows for fast experimentation as well as human error.

Quit (Right Amiga-Q)

This is the same as clicking in the close gadget in the upper left corner of the Turbo Silver Object Editor window. You're returned to the Animation Editor in which the program starts.

Escape (Right Amiga-])

Use this command to exit a cell to the Animation Editor without retaining any changes. The cell is not saved to disk, and if you re-enter the cell it's exactly as it was before.

Special Menu

This menu contains an assortment of important commands. Presented here are some of Turbo Silver's most useful functions--it'll pay you off in time savings to learn their Hot Key equivalents as soon as possible.

Free (Right Amiga-F)

Use this command to free the camera from tracking an object or group. See Track below for further details.

Track (Right Amiga-T)

Pick an object, then use the Track command to have the camera automatically follow the object anywhere it's moved. You can also move the camera and it will continue to track the object.

All objects in Turbo Silver 'contain' or are associated with a unique small set of X,Y,Z axes. The origin of the axes is the 'hot spot' on which you must click to pick the object. The Track command lets you set the camera to always point directly towards the hot spot of an object or parent object of a group. Then no matter where you move the object or group, the camera follows it. This saves you the arduous work of manually aiming the camera, and allows for such special effects as the classic cinematic 'fly-by' shot. To prevent automatic tracking use the Free command, above.

The Track command affects and is affected by the Camera command. Basically, an object must be tracked in order for the settings Wide Angle, Normal, and Telephoto to take effect. See Camera settings requester in the Settings menu below.

Apply (Right Amiga-)

Use Apply to transfer an object's attributes (see Attributes under Settings
menu, below) to one or more other objects. This command gives the
effect of the Cluster command without the necessity of grouping objects.

Use Multi mode to pick first the object whose attributes are to passed on,
then all objects to which the attributes are to be copied. That is, while
holding down the left Shift key first pick the object whose attributes are to
be transferred, then the others, then invoke the Apply command. This
works the same as Cluster, below, but doesn't require objects to be
grouped.

Cluster (Right Amiga-K)

This command lets you transfer a parent object's non-color-related
properties to all other members of its group. Pick the group by clicking
on the parent object in Pick Group mode, then set any attributes as
necessary, then select the Cluster command. The Cluster command
doesn't transfer the attributes Color, Reflectivity, and Filter.

When grouping objects the parent object is always the first chosen.
Objects needn't be of the same type--for instance, you can set the same
properties for a number of different shapes by grouping them to an axis
(which is invisible), then setting blending, specularity etc. only for the
axis. We suggest an axis because you can also use it as a center of
rotation for the group.

When wrapping a brush around an object (see Brush menu below) you
must load the brush onto an axis, group the axis to the object, and finally
Cluster the two.

Home (Right Amiga-H)
Next (Right Amiga-N)
Last (Right Amiga-B)

Use these three commands to find specific objects in the order created. They're useful for easing your way in a busy workspace. Home selects and centers the first object created in the window, Next selects and centers the object created immediately after the currently picked or selected object if any, and Last selects and centers in reverse order of creation. Groups and objects are turned orange when centered, faces and edges turn green, and points turn light blue, ready for picking with F1 and Marking (see below) and subsequent repositioning.

Last uses Right Amiga-B as a mnemonic for 'back' or backwards. Use the Next and Last (or Forward and Back) in conjunction with Left Shift-F1 (multi-mode select) in Pick Face mode to quickly mark contiguous faces for stripes of color or any other effect.

Find (Right Amiga-V)

Use to quickly find an object or group by name. Invoking this command after selecting an object displays a requester. Enter a unique name--any combination of letters, numerals, and punctuation is allowed. If the name is one that you or the program has given to an object or group, the object appears selected in the center of the window. If there are more than one object with the name searched for, the first one created is shown.

Mark (Right Amiga-M)

Use this command after picking a group, object, or set of points to prepare it for repositioning. The group or object turns green--click anywhere in the screen to set the new location. In the case of points, even though the

entire object turns green only the selected points are repositioned. Select
objects by clicking on the hot spots or with the Home, Next, Last, and
Find commands (see above). This also works with faces, only the axis is
repositioned instead of the face.

NOTE: An easy one-key alternative to this command is the F1 key, which
marks picked objects for moving.

Redraw (Right Amiga-R)

Invoking this command causes all objects to be redrawn on the screen in
their current position. This command is necessary as occasionally in the
heat of editing the program can forget to redraw an object.

Auto Redraw
Manual Redraw

Only one of these is active at a time. The program starts in Auto Redraw,
which means that all objects are redrawn whenever you change anything.
If you have a lot of objects on the screen and are only concerned with one
at the moment, turn on Manual Redraw to speed up the program. Other
objects may not appear properly after transformations when Manual
Redraw is on. Select the Redraw command (above) when in Manual
Redraw to see all objects.

Hint: Another way to speed up redraw is to set complex objects to Quick
Redraw--see Attributes below.

Settings Menu

This menu contains all the commands for manipulating objects and the 3D universe in which they're contained. Featured are the four full-screen requesters; Global settings, Camera settings, Transformation, and Attributes. Each of these allows you to make a number of varied adjustments to existing settings at one time without having to invoke several different menu items.

Globals   (Function Key F4)

The first Settings menu item controls aspects of the entire scene such as ambient lighting, camera, sky characteristics, and heuristics which controls objects' edges and surfaces. You can invoke the Global Settings requester at any time with this menu item, or by pressing the F4 key. The requester appears:
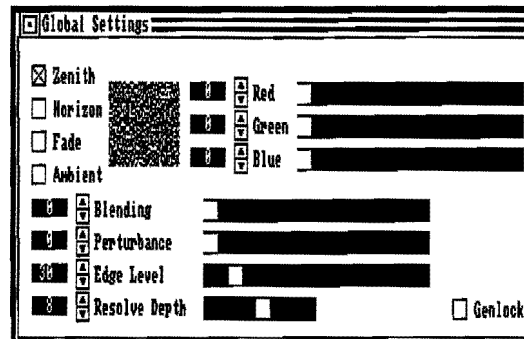
Global Settings Requester

Exit the requester by clicking on its close gadget in the upper left corner, whereupon all settings take effect. To return to conditions before changing the Global settings, use the Undo command (Right Amiga-U)

before selecting any other command.

Following is a discussion of each of the settings available through the Global Settings requester, from top to bottom:

With the uppermost Global Colors settings you can set a range of colors from horizon to zenith, set the fog fade-out color, and set the color and strength of ambient light. To set any of the above, click on the square gadget next to its name in the upper left corner of the requester. Next the gadgets in the upper right change to show the current setting, if any, with the color depicted graphically in the large square. From left to right, for each of the colors, you can click the mouse pointer on the number and type in a new value, or adjust the value upward or downward by clicking and holding on the up or down arrow gadgets, or click and drag on the horizontal value sliders.

The Blending, Pertubance, Edge Level, and Resolve depth all have their own settings gadgets, which work identically to those described immediately above.

Zenith
Horizon

Click on either gadget to set the sky colors at the zenith or at the horizon. When the Camera Aim X-axis setting is 0 or 180 degrees you're looking at the horizon, which in the real world is what you're looking at when you stand outside and look straight ahead. Rotate your view 90 degrees in either direction on the X-axis and you're looking at the zenith, which, in the real world, is where your finger is aimed when you point straight up or down. The default settings are black, which gives no sky. You can set any of the Amiga's 4096 colors for either or both with the red, green, and blue value adjustment gadgets. If you set two different colors Silver automatically blends the two into each other using an appropriate range of

colors in between. You can set the dithering or smoothness of this effect with the Global Blending setting below.

Fade

Select this gadget to set the color of the fog effect (activated with the Fuzzy setting from the Camera settings requester--see below), activated with the Global Focusing Fuzzy command. As with any other color setting in Silver, you can set this to any of the Amiga's 4096 colors with any of the red, green, and blue color value adjustment gadgets.

Ambient

Ambient lighting affects a scene's overall brightness--it's a reflected light source that has no particular location. A degree of ambient light may be necessary to avoid inky-black shadows, but too much can cause washed-out scenes. The default setting is no ambient light. Use this command to set ambient light color to any of the Amiga's 4096.

Blending

This setting determines the amount by which the range of screen colors overlap (by dithering) with each other if you've set two different sky colors. The color range is set with the Global settings commands Horizon and Zenith (see above). A setting of 0 gives solid banded colors and the maximum setting of 255 gives a completely dithered sky .

Perturbance

Perturbance is used in animation to give the sky a variable look of turbulence, as in a storm. The perturbance slider ranges from 0 to 255. The perturbance effect is obtained by varying the dithering pattern for the sky's shading from frame to frame, causing a semi-random moving effect.

As with all of Silver's features, we strongly encourage to experiment with
this effect as much as possible.

Edge Level

Anti-aliasing is a computer-graphics technique for smoothing off blocky
edges ('jaggies') in a limited resolution environment such as the Amiga's
320-wide HAM mode used for ray tracing. The initial setting is 30 in a
range from 0 to 255. The higher edge level is set, the longer a scene takes
to render, but the smoother edges appear.

Resolve Depth

When rendering glass objects in silver, ray-tracing times can be too long
to make experimentation convenient. To temporarily reduce these times
you can limit the extent of rays sent out by the tracer by lowering the
resolve depth. Bear in mind, however, that changing this value alters the
effective index of refraction of materials such as glass and crystal. This
slider's value ranges from 0 to 15, and starts out at the middle level of 8.

Genlock

When selected this sets the sky to background color so that any genlocked
video signal shows through. See your genlock unit's instructions for
further information.

Camera   (Function Key F5)

Use this Settings menu item to control Silver's camera, which is your
point of view in the 3D universe. The camera always appears as the small
circle to the left of center in the frame when you first enter the object
editor for any cell. When viewed from the side you can see a short line

emanating from the camera pointing in the direction in which the it is aimed. The unique camera settings in the Global menu Camera submenu control a good deal about the final appearance of your Silver-generated images.

Select Camera from the Settings menu or press function key F5 to display this requester:

```
┌─────────────────────────────────────────────────┐
│ □ Camera Settings═══════════════════════════════ │
│                                                  │
│   Camera Position X  ▓▓▓-100.000▓ ▲▼  ☒ Manual   │
│   Camera Position Y  ▓▓▓-100.000▓ ▲▼  □ Wide Angle│
│   Camera Position Z  ▓▓▓100.000▓  ▲▼  □ Normal    │
│                                        □ Telephoto│
│   Camera Angle    X  ▓▓▓0.000▓    ▲▼  □ Custom    │
│   Camera Angle    Y  ▓▓▓0.000▓    ▲▼     ▓1.000▓ ▲▼│
│   Camera Angle    Z  ▓▓▓0.000▓    ▲▼             │
│                                                  │
│   Focal Length       ▓▓▓100.000▓  ▲▼             │
│   Fade Start         ▓▓▓100.000▓  ▲▼  ☒ Sharp    │
│   Fade Finish        ▓▓▓1000.000▓ ▲▼  □ Fuzzy    │
└─────────────────────────────────────────────────┘
```

Camera Settings Requester

Value-entry gadgets in the Camera Settings requester don't use sliders. Adjust values by clicking on any box containing a number and editing the entry, or by clicking and holding on the up or down arrow gadget next to the number. If you hold longer than a few seconds, the rate of value change accelerates.

Exit the requester by clicking on its close gadget in the upper left corner, whereupon all settings take effect. To return to conditions before changing the Camera settings, use the Undo command (Right Amiga-U) before selecting any other command.

Following are the Camera settings available in the requester:

Position

Upon selecting the Camera Settings requester the first three settings show
the camera's current position on the X, Y, and Z axes, which is initially
-100,-100,100. You can position the camera anywhere in Silver's 3D
universe with the requester's Camera Position X, Y and Z- axis gadgets.

It's often easier, though, to position the camera interactively via the object
editor window. Click twice on the camera--it turns green--then click on
the new location. The camera disappears from its original location and is
redrawn where you clicked. Do this from all three views (see View Menu
below) for precise camera placement.

Camera Angle

One of the most important points to remember in Silver is always keep the
camera aimed at your focus of interest. An easy way to do this is with the
Track command (above under Special Menu). Or you can use the Camera
Angle settings to aim the camera precisely.

Focal Length

This setting only applies when the Manual lens setting is in effect (see
Lens Setting below). The focal length of the camera lens determines the
width of the camera's field of vision. The lower the number, the wider the
field of vision, and the higher, the narrower. The range settings use the
convention of 35mm camera lenses. For example, most cameras come
with a 50mm lens, which gives a narrower view than the standard human
field of vision, which is comparable to a 28mm lens. The Focusing
submenu (below) gives you several automatic settings for Range.

Fade Start
Fade Finish

When the Camera Settings Fuzzy option (see below) is in effect, the Fade command lets you set a gradual fog fadeout special effect along the Y (in-out) axis. The primary purpose for doing so is to avoid distracting the viewer with unnecessary horizon details, an artifact of Silver's camera lens' infinite depth of focus. The two adjustments let you to set the position on the Y axis at which fog initially appears and at which total fadout occurs--default settings are 100 and 1000 units. The fog gradually thickens from the first to the second point.

To put the Fade into effect, you must select the box labeled Fuzzy in the requester's lower right corner. Also, you can set the fog's color with the Fade setting in the Global Settings requester (see above).

Lens Setting

The five gadgets in the upper right of the Camera Settings requester give you several automatic camera range settings, as well as the ability to temporarily override the manual range setting with the Custom setting. Only one setting is available at a time--an X appears in the box to the left of the active item. Lens settings are analagous to those used in conventional photography, with exceptions as noted below.

Manual

This item, when selected, tells Silver to use the Focal Length setting from the Camera Settings requester--see above for details. This works just like a real camera lens--the higher the focal length, the closer the object appears and the less distortion is visible.

Wide Angle
Normal
Telephoto

These three automatic range settings simulate three standard focal-length
lenses used on 35mm cameras: the 35mm wide angle lens; the 50mm
normal-length lens; and the 135mm telephoto lens. Object tracking (see
Special menu above) must be in effect for this to work. These mainly
control apparent distortion. To change the image size, move the camera
closer to or farther away from the subject.

Custom

The Custom setting lets you set an apparent size for objects in view
without regard to any range setting. The slider lets you set any value
between 0 and 2.55, the maximum size at which the camera appears to
practically on top of the object.

Sharp
Fuzzy

Sharp, the default condition, means all objects within view of the Silver
camera lens are in detailed focus, including the horizon line if any. Since
the horizon line can sometimes be unnecessarily distracting, you can
create a detail-obscuring gradual fog at the horizon with the Fuzzy setting.
Use Fade Start/Fade Finish in the Camera Settings requester to set the
point at which fadeout starts and at which it's totally obscuring. Use Fade
in the Global Settings requester to set the fog's color. An X appears next
to the selected item--only one or the other can be set at one time.

Transformations   (Function Key F6)

The settings in this requester pertain to objects in the 3D universe. Unless otherwise specified, the term 'objects' can refer to groups, single shapes, or parts of shapes such as points, faces, and edges. Most manipulations can apply to single objects as well as groups of objects selected with the left Shift key held down, in 'Multi' mode. In order for Silver to know which object you want to manipulate, you must first pick the object, which can be done with the mouse, keyboard, or a combination of the two.

At any given time you can pick grouped objects, single objects, points, edges, or faces. Pick Group mode is an exception--you can also pick single objects in this mode. Picked objects and groups are blue, and picked points and faces are red. In Silver, a 'selected' object appears orange, selected points are violet, and selected faces and edges are green. In any case, you pick a selected object by pressing the F1 function key.

You can pick multiple objects, groups, points, or faces by holding down the left Shift key as you click on your choices. When you hold down the left Shift key the word 'Multi' appears at the top of the screen to signify that you're in Multi mode.

When you select multiple objects (rather than grouped objects) for transformations, you're presented with the Transformations requester for each object selected, in the order selected. That is, each time you close the requester it reappears for the next object, until all objects are set.

NOTE: Transformations in this requester performed on picked faces or edges affect only the object's axis. To translate or rotate faces, pick all associated points in Point mode.

See the section entitled 'Picking and Selecting Objects' above for further information.

When you select Transformation from the Settings menu or press function
key F6 (after picking an object, of course), the Transformations requester
appears:

```
┌─────────────────────────────────────────────────────────────┐
│ □ Transformations                                            │
├─────────────────────────────────────────────────────────────┤
│  Align X  ▓▓▓ ▲▼   Size X  ▓▓▓ ▲▼   Position X  ▓▓▓ ▲▼        │
│  Align Y  ▓▓▓ ▲▼   Size Y  ▓▓▓ ▲▼   Position Y  ▓▓▓ ▲▼        │
│  Align Z  ▓▓▓ ▲▼   Size Z  ▓▓▓ ▲▼   Position Z  ▓▓▓ ▲▼        │
│            Apply □           Apply □            Apply □       │
│                                                              │
│  Rotate X ▓▓▓ ▲▼   Scale X ▓▓▓ ▲▼   Translate X ▓▓▓ ▲▼        │
│  Rotate Y ▓▓▓ ▲▼   Scale Y ▓▓▓ ▲▼   Translate Y ▓▓▓ ▲▼        │
│  Rotate Z ▓▓▓ ▲▼   Scale Z ▓▓▓ ▲▼   Translate Z ▓▓▓ ▲▼        │
│    Local □  World □   Local □  World □   Local □  World □     │
└─────────────────────────────────────────────────────────────┘
```

Transformations Requester

Note that any relevant current settings are displayed in the various fields.

Exit the requester by clicking on its close gadget in the upper left corner,
whereupon all settings take effect. To return to conditions before
changing the Transformation settings, use the Undo command (Right
Amiga-U) before selecting any other command.

Value-entry gadgets in the Transformations Settings requester don't use
sliders. Adjust values by clicking on any box containing a number and
editing the entry, or by clicking and holding on the up or down arrow
gadget next to the number. If you hold longer than a few seconds, the rate
of value change accelerates. Following are the Transformations settings
available in the requester:

Align

The first three settings allow you line up any object or group's axis, and
the object as well, with that of the 3D universe--in other words, to

straighten it up (or out). Align is an absolute rotation, whereas Rotate, below, is a relative rotation.

First pick the object to be aligned, then press F6 or select Transformation from the Settings menu. When the Transformations requester first appears, the object's current alignment is displayed. To return an object to its original orientation after any amount of rotation, set the X, Y, and Z alignment to 0, then close the requester. Or you can set any alignment on the X, Y, and Z axes.

When you adjust any of the align values, the Apply box below automatically becomes selected (contains an X). To prevent the new settings from taking effect, click again on the Apply box so that it's no longer selected.

Size

The values displayed next to Size X, Y, and Z in the Transformations requester indicate the picked object's current size and lets you change the size in Silver world units in the direction of any or all of the world X, Y and Z axes in absolute terms. To resize faces pick the associated points and use the Scale command, below.

When you adjust any of the align values, the Apply box below automatically becomes selected (contains an X). To prevent the new settings from taking effect, click again on the Apply box so that it's no longer selected.

Position

The requester displays the picked object's current absolute position and lets you set a new position in the Silver world via the X, Y, and Z axes. Alternatively, you can position objects interactively by clicking on them

twice (at the origin of the object's axis), then clicking in the new location.
To change objects' location by relative amount, use the Translate
command below. To move any of an object's faces or edges, go into Pick
Point mode, pick the associated points and reposition them.

When you adjust any of the position values, the Apply box below
automatically becomes selected (contains an X). To prevent the new
settings from taking effect, click again on the Apply box so that it's no
longer selected.

Rotate

Rotation is always performed about the center of an object or group as
defined by its axis, and is a relative motion. You can reposition the axis
by picking the object, entering Pick Face mode and picking any face, then
use the Position command (menu or interactive) to place the axis.

When you change any Rotate setting, the box marked Local below the
settings becomes selected. Local rotation uses the object's own axis for
orientation. To rotate objects using the constant world axes for
orientation, select World by clicking in the box next the word World.
Remember, rotation about the X axis works like a spit or lathe, about the
Y axis is like turning a doorknob, and about the Z axis is like a spinning
barber pole. To rotate faces, go into Pick Point mode, pick the associated
points and rotate them, remembering that the center of rotation is always
the object's axis.

Scale

These settings let you resize picked objects in relative units rather than the
absolute units used in the Size command. In scaling an object the Scale
values are multiplied by the object's current size. That is, a Scale value of
1 means the object stays the same size, 3 triples the size, and .5 halves it.

To scale a face or group of faces belonging to a picked object, pick any faces by going into Pick Point mode and picking all associated points, then scale in the desired directions. You can scale on any or all of the three axes with respect to the the object's own axis (Local) or the world axis (World).

Translate

The Translate settings let you move picked objects units a given distance from their current position--that is, a relative move rather than the Position command's absolute move. Translation is described in Silver world units via the X, Y, and Z axis settings. To translate faces, go into Pick Point mode, pick the associated points and reposition them. You can perform translation on any combination of the X, Y, and Z axes with respect to the Local or the World axis.

Attributes (Function Key F7)

You can assign attributes such as color, reflectivity, transparency, etc., to groups, objects, or faces. While the first three attributes--Color, Reflectivity, and Filter--can be applied to individual faces as well as to objects and groups, the rest can only be applied to groups or objects--they're all specified below. A number of special effects are available with these settings--the combinations are virtually endless!

As with the Transformations requester, described above, you must first pick an object, group, set of objects, or faces. If you pick a group of objects in Multi mode, the Attributes requester reappears for each subsequent object when you close it. After picking objects, select Attributes from the Settings menu or press function key F7. The requester below appears:
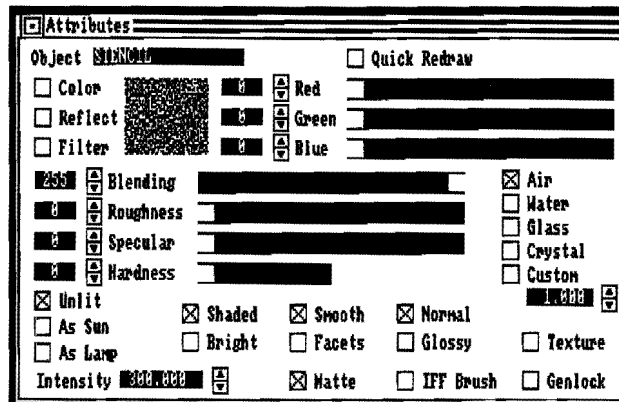
Attributes Requester

Exit the requester by clicking on its close gadget in the upper left corner, whereupon all settings take effect. To return to conditions before changing the Attribute settings, use the Undo command (Right Amiga-U) before selecting any other command.

Following is a description of each Attributes requester setting from left to
right and top to bottom:

Object

This field shows the object's current name. To rename the object, click in
the field and edit it to show the new name, pressing Return when done.
All lower case letters are converted automatically to upper case by the
program.

Quick Redraw

Click in the box next to Quick Redraw to activate this attribute for an
object. When active, Quick Redraw means the object is represented in the
Object Editor as a box with an axis. The box is three-dimensional and
roughly shows the object's size from any view, but no surface details.
However, the object always appears accurately in the Wireframe view and
when rendered. This greatly speeds up working with complex objects in
the Object Editor. All object editing commands work as usual with
objects set to Quick Redraw.

Color, Reflectivity, and Filter

These three settings use the same set of gadgets to display current values
and set new ones. To use any one, first click in the appropriate box in the
top left of the Attributes requester. The Color, Reflectivity and Filter
settings are not transferred among members of a group when you use the
Cluster command (see Special Menu above).

Color

You can apply any of the Amiga's 4096 colors to any group, object, or
face. This sets the brightest color--shading produces darker hues. First

click in the box next to Color, then use the mouse to control the Red,
Green, and Blue color settings via the up/down arrows and sliders, or click
on the number box and type in a new value between 0 and 255. The
current color is shown in a large square box in the requester after you
click on color. Note that for picked objects this is the object's basic color,
which doesn't reflect any faces you may have recolored individually.

Reflect

Reflectivity causes objects or faces to have mirror-like properties,
showing reflections of objects around them. This differs from a shiny
effect (like a cue ball), which you can set with a combination of
specularity, hardness, and Glossy, all of which are explained below. You
can set red, green and blue reflectivity individually between 0 and 255.

Some of Silver's most dramatic effects are available with this command.
Any group, object, or face in Silver's world can be set to reflect some or
all of the red, green, and blue light that comes its way. Thus for unusual
effects you could have, for example, a green object that reflects only red
light! Be careful about using the higher reflectance values--perfect
reflectors are invisible!

Notes on Reflectivity

We have found, after many hours of experimentation, that there is
definitely an art to using reflective objects in Silver's world. The problem
lies in situating the right sorts of things next to each other--you can't see
that an object is reflective unless there's something of the right color
nearby. For example, a gold sphere in a blue world or illuminated by blue
light doesn't look gold. But place it on table top behind a goblet, a pear,
and an apple, and it will look like a gold sphere. Use the Glossy setting to
create shiny-looking objects without requiring reflectivity.

Filter

The Filter settings determine transparency for selected objects or faces. Just as any object can reflect light in any of the three additive colors (red, blue and green), it can pass light through, or be transparent. What's more, both properties can be combined in a single object. Select objects to be adjusted, then activate this command. The red, green and blue sliders in the requester that appear can be adjusted from 0 (pass no light) to 255 (pass all light, or completely transparent). Transparency can be combined with refraction (see Material below) to simulate such materials as glass, water, etc. Also, set red, green, and blue transparency to 255 for the Glossy effect.

Blending, Roughness, Specular, and Hardness

These special properties can be applied only to selected objects or groups, not specific faces. The requester has separate up/down arrow settings and sliders for each property. You can also click on the box showing the numeric value and edit it with the keyboard.

Blending

This lets you set the blending for any object between 0 and 255. Blending determines the amount by which the range of an object's shading colors overlap (by dithering) with each other. When blending is set to 0 on shaded objects a solid banding effect occurs. For more realistic effects set blending between 30 and 100. Set blending below 25 for objects to be colored as IFF brushes.

Roughness

This command lets you set an apparent rough surface for objects in Silver. Most objects in ray-traced scenes on the Amiga have a characteristic

smooth look because such objects are quickest to render. By increasing this setting you can simulate such surfaces as wood, rough stone, etc. As with all such settings experimentation will lead you to the most satisfactory results. You can set roughness for any object between 0 and 255.

Specular

Specularity refers to the small white reflection of the light source on brightly lit shiny objects. This setting, which ranges from 0 to 255, lets you control the intensity of each object's specular spot--first select the object, then select Properties from the Attribute menu and use the mouse to set specularity.

Hardness

This value interacts with the Specular value above to control the brightness of the specular spot. For example, a Specular value of 255 and a Hard value of 15 gives the smallest, brightest spot possible, while lower values of Hardness spreads it out and lower values of Specualr decreases the intensity.

Material

Immediately to the right of the above property settings is a column of settings that lets you determine an object's **index of refraction**. This works only on selected objects (and groups), not parts of objects. The requester always shows an X in the box next to the material setting for the selected object. The Material command lets you set an object's index of refraction, thus simulating different types of transparent substances such as glass, crystal, etc. Of course, the effect is only visible if objects are transparent (see Group Filter above).

Air

This is the default setting and is automatically assigned to all newly created objects. When you set any degree of transparency for an object, the Air material setting means that rays of light pass through it without being refracted at all, as if the object were made of air.

Glass
Water
Crystal

Although you can assign any realistic index of refraction to any object in Silver, we've given you three built-in settings for convenience. For reference:

Substance	Index of Refraction
Glass	1.66
Crystal	2.00
Water	1.33

See Custom below for further information.

Custom

This setting lets you assign any index of refraction from 1.00 to 3.55 to objects in Silver. Simply select the object, then select Attributes and enter the new value into the requester with the mouse or keyboard. Here's a sample table of indices of refraction for various substances:

Substance	Index of Refraction
Salt	1.54
Quartz	1.55
Emerald	1.57

Substance	Index of Refraction
Lapus Lazuli	1.61
Topaz	1.61
Ruby	1.77
Sapphire	1.77
Diamond	2.42

As a rule of thumb, the higher a substance's index of refraction, the longer
it takes to trace. To shorten tracing time for scenes containing refractive
objects, lower the Resolve setting (see Globals above).

For an authoritative list of indices of refraction, consult the CRC
Handbook of Chemistry and Physics, 63rd Edition, published by CRC
Press, Inc. of Boca Raton, Florida.

Unlit, As Sun, As Lamp, Intensity

These settings in the lower left corner of the Attributes requester
determine whether or not an object acts as a source of light, and if so, its
nature. Any object can be a light source, in which case the direction or
directions in which it casts light is determined by its shape and position.
A flat object casts light forward and backward (or up and down,
depending on its orientation), while spherical objects cast light in all
directions. Note that light sources themselves aren't visible in Silver's
world, so most other attributes don't apply to them.

Unlit

This is the default setting for all newly created or imported objects. Unlit
means the object doesn't act as a light source, but reflects and/or transmits
light, depending on its other attributes.

As Sun
As Lamp

Setting a selected object to As Sun causes it to illuminate all objects with equal intensity disregarding distance from the light, just like ol' Sol. The closer a Sun is to an object, the shorter the shadows and the brighter the specular spot (see Specular under Properties in the Attributes Menu section below).

To simulate a more earth-bound type of light, use As Lamp to illuminate objects in inverse proportion to their distance from it. That is, of course, the further the object, the less the illumination. Positioning a lamp very far from objects results in little or no illumination.

Silver is limited to a maximum of 32,000 light sources in a single scene.

Intensity

With objects set to As Sun or As Lamp, this gadget lets you set the light's strength. The initial setting is 300, and average value. We recommend against extreme changes in light intensity-- too much can cause glare, and too little reduces object shading and visibility.

Shaded
Bright

You can set any object to shaded or bright, but not both. This setting's effect depends on whether an object is set to Unlit or acts as a light source. Newly created objects in Silver are set to Unlit and Shaded, which means they're illuminated by light sources in a realistic way--the point closest to a light is brightest while other sides fall off in brightness and become progressively darker. Setting an unlit object to Bright causes all sides to be illuminated the same, as if the object were itself a dim light source. Bright objects don't illuminate other objects, though.

When you set an object to be a light source with As Sun or As Lamp, the
Bright setting is automatically selected. This means that no shadows are
cast by the light source. Click on Shaded to cause the light source to cast
shadows. Use of the Shaded option lengthens rendering time, as extra
calculations are required to draw the shadows. When using multiple light
sources we recommend setting no more than one or two to Shaded to
minimize rendering time.

Smooth
Facets

Newly created objects in Silver are set to smooth, but Facets is an
alternative setting which gives objects a 'blocky' look. Selecting Facets
turns off smoothing for a selected object. Large faces in Silver are usually
made up of a number of smaller triangular facets, a special technique
called Phong smoothing is applied to simulate a rounded surface. In some
cases such as with extruded 3D alphabet letters and symbols, you'd want
edges to appear sharp so set these to Facets.

Normal
Glossy

The Normal setting is assigned by default to all newly created objects.
The alternative Glossy setting lets you give non- reflective objects a shiny
appearance. For Glossy to take effect you must also set an object's Filter
settings for red, green, and blue to 255. Try combining Glossy with
Reflective to enhance the appearance of shininess.

Texture

Texture is an independent setting which can be combined with any other
combination of attributes. After setting an object to Texture, use the

Texture menu to load a texture onto an object and set attributes. See the section on the Texture menu below for detailed information on this unique, open-ended option.

Coloring--Matte, IFF Brush, Genlock

These three alternative settings determine the nature of an object's allover coloring. The default setting is Matte.

Matte

All newly created objects in Silver are automatically assigned this Coloring setting, which means that the object is colored with whatever color or colors you assign it with the Color setting at the top of the Attributes menu.

IFF Brush

This option sets an object to use an IFF Brush, or picture file, as coloring. One of Silver's special features is the ability to apply pictures from paint programs such as Deluxe Paint II and our own Diamond digitizing and paint program around 'solid' objects in silver. To create a resizable IFF brush, Add an Axis, set it to IFF Brush coloring via this menu item, then load an IFF brush into it with the Brush menu. Also, IFF Brush objects acting as light sources (As Sun or As Lamp) project their images onto nearby surfaces. See Brush Menu below for details.

Genlock

Coloring an object as Genlock means that its entire surface is always assigned the background color (usually black) so that any genlocked video signal shows through. See your genlock unit's manual for details.

Skin

This command lets you custom-build complex objects from a number of cross-sections. Although each cross-section can be any kind of object, in practice it's best to use flat groups of points connected by edges (or faces, if you want the cross-sections to be solid in the final object). The only restriction is that **all cross-sections must contain the same number of points.** Cross-sections can be oriented (rotated) any way with respect to each other--that is, they needn't be parallel--and they can be of any shape. After creating and positioning all cross-sections, enter Pick Object mode, pick all cross-sections while holding down the left Shift key (Multi-mode), then select Skin from the Settings menu. After a few moments, the cross-sections are connected together in a solid object. If its shape isn't satisfactory, use the Undo command (Right Amiga-U) and try again.

Here's a short tutorial which illustrates one of the many ways to use the Skin command. As with any Silver command, don't be afraid to experiment--you may be surprised and pleased with the results!

1. In a new Object Editor workspace (make sure you're in Front view mode), use Add Axis from the Edit menu to begin creating a cross-section.

2. Pick the axis (press F1) and use Add Point from the Edit menu to add five or so points to the axis in a roughly circular arrangement.

3. Use Add Edge from the Edit menu to connect the points in a circle. This is the first cross-section.

4. Enter Pick Object mode (press Right Amiga-2). Make sure the object is picked and is colored blue.
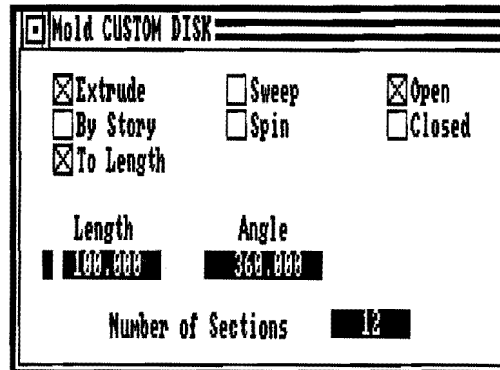
5. Use the Copy command from the Edit menu, or press Right Amiga- C.

6. Go to the Top view by pressing function key F10.

7. Press F1 to turn the picked cross-section green and ready it for interactive repositioning. Now click on the screen an inch or so above (behind) its original position and a half-inch to the side. The object should disappear from its original position and reappear where you click.

8. Return to the Front view by pressing F9.

9. Now select Paste from the Edit menu or press Right Amiga-P to create a copy of the cross-section on the screen in the same position from which it was copied.

10. The original cross-section should still be blue to indicate that it's picked. If not click on either cross-section so it turns blue.

11. Select Point from the Pick menu.

12. Click twice on any point in the cross-section--the point turns red and the cross-section turns green. Then click anywhere else on the screen to reposition the point and connected edges.

13. Repeat step 12 with one or two other points.

14. Return to Object mode from the Pick menu, or press Right Amiga-2.

15. One of the cross-sections should be picked (blue). Hold down the left Shift key and click on the other cross-section's axis, so both cross-sections are blue.

16. Select the Skin command from the Settings menu.

17. After a few moments, the new object appears, with faces connecting
all points in the two original cross-sections. For a clearer view, use Top
or Wireframe mode from the View menu.

Mold

Select this command from the Settings menu after picking an object to
invoke the Mold requester. The Mold command lets you create new
objects by **extruding** or **spinning** objects or outlines in various ways, all
detailed immediately below. In most cases, best results with Mold
functions are obtained with outlines composed of points and edges.

The Mold requester looks like this:

```
┌──────────────────────────────────────────┐
│ ▣|Mold CUSTOM DISK════════════════════    │
│ ┌──────────────────────────────────────┐  │
│ │  ☒Extrude      □Sweep      ☒Open     │  │
│ │  □By Story     □Spin       □Closed   │  │
│ │  ☒To Length                          │  │
│ │                                       │  │
│ │     Length         Angle             │  │
│ │  ▌ 100.000      ▌ 360.000            │  │
│ │                                       │  │
│ │     Number of Sections    ▌ 12 ▌     │  │
│ └──────────────────────────────────────┘  │
└──────────────────────────────────────────┘
```

Mold Requester

This requester gives you two methods of creating custom objects;
extruding and spinning/sweeping. The Length setting applies only to
extrusions, while the Angle and Open/Close settings apply only to
swept/spun objects. The Number of Sections setting affects both extruded
and swept/spun objects.

Extrude

The Extrude command is the Mold requester's default setting. This function lets you create solid objects from two-dimensional outlines composed of points, or any other shape. You can extrude in a straight line along or along a three-dimensional path. You can also set the number of sections for an extruded object. The Angle setting in the Mold requester doesn't apply to extrusions.

Here's the basic procedure for creating a shape from points and edges, then extruding it:

• Use the Add Axis command to place an Axis object in the workspace.

• Make sure Front View is activated from the View menu.

• Use Add Point to add several points to the axis in an outline of the shape to extrude. You can add points anywhere in the window.

• Use Add Edge and/or Add Face to connect the points in the shape of the desired outline. If a flat object with faces is extruded, each section will have the same faces on both ends, but if you extrude an object consisting only of points and edges, the ends will be open.

HINT: You needn't connect a set of points to be extruded in one continuous line. If you're adding edges, to start a new line of edges press Right Amiga-2 (Pick Object), then re-enter the Add Edge mode (Right Amiga-7) and start with a new point.

• To extrude along a path first create the path, then assign the object to be extruded to the path. See Story below for detailed information on using paths.

• Activate the Mold requester from the Settings menu and set the number
of units to extrude--the depth of the extrusion--and the number of sections.
To extrude along a path, click on the box labeled By Story, and be sure to
first assign a path to the object. Close this requester to perform the
extrusion.

• If the results are unsatisfactory, use the Undo command (Right
Amiga-U), pick the object or create a new one to extrude, and repeat the
process.

Extrusion by length is always performed along the Y (in-out) axis. For
each section Silver makes a copy of the object a small distance from the
original with lines connecting every vertex.

Extrusion Example

Step-by-step instructions for making a sample extruded letter M follow:

1. Use the Edit Menu Add Axis command to add an axis to the workspace.

2. The axis should be orange. Pick it (press F1)--it turns blue.

3. Go into Add Point (Right Amiga-3) mode and add points to outline a
capital letter M as indicated below. Make the letter fairly large, filling
about a third of the screen.

4. Select Add Face from the Edit menu (Right Amiga-6) and connect all
the points into triangles by clicking on each set of three points to join in
turn. You can use your own scheme or follow the example on the next
page:
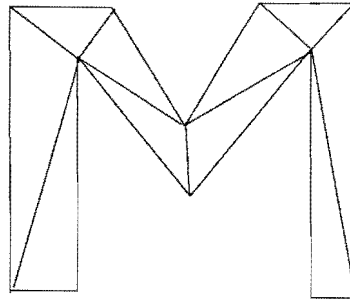
letter M divided into triangles

5. Go into Pick Object mode (Right Amiga-2).

6. Select Mold from the Settings menu.

7. The Mold requester appears showing the object's name in the title bar. Extrude style is set to By Length, and the length is set to 100. This is the length along the Y axis, or the depth.

8. Click on the box labeled Number of Sections, which contains the number 12. Edit this to 1 with the keyboard and press Return.

9. Click on the close gadget in the Mold requester's upper left corner to extrude the M outline.

10. The unit is extruded. To see its depth, select Top View from the View menu. Then return to the Front view.

It's that simple to extrude a solid letter M. If we'd wanted a hollow one, with no front and back, we'd have connected the dots in an outline of an M with Add Edge, and extruded that.

Sweep
Spin

These powerful commands let you create solid objects seemingly spun on
a lathe. While any object can be swept or spun, best results are obtained
with flat outlines created from points and edges. Objects are always spun
on the Z or vertical axis, and use the object's axis as the line of symmetry.
Therefore, it's usually a good idea to perform Sweep/Spin operations
while the Front view is active. The difference between Sweep and Spin is
that while Sweep spins all points, in Spin the first and last points act as
anchors and are not swept about the axis. Thus for fully symmetrical
objects you should always use Sweep.

Mold requester settings that affect Sweep and Spin are Angle, Number of
Sections, and if the angle is less than 360 degrees, Open/Closed. Angle
sets the number of degrees by which an object is spun about its axis (e.g.
180 degrees spins it halfway). Number of Sections sets the number of
divisions around the object's circumference--the more sections, the
smoother the object's outline appears when rendered, but the more
memory is required. For objects spun less than 360 degrees, Open/Closed
determines whether triangular facets are created on the unspun faces of the
object.

Here's the basic procedure for using the Sweep/Spin functions from the
Mold requester:

• From the Front view, use Add Axis

• Use Add Point to set a number of points in the object's profile

• Connect the points with Add Edge

• Select Pick Object (Right Amiga-2), then the Mold command
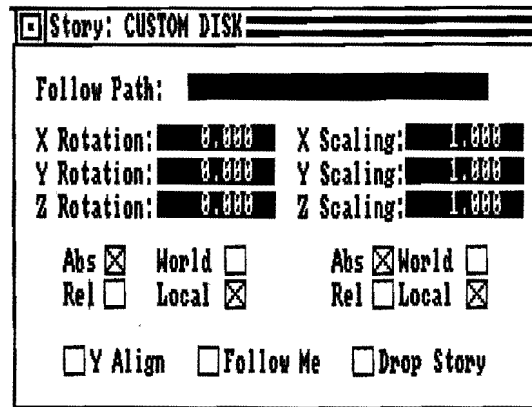
• Set the number of sections and number of degrees to spin, and if the latter is less than 360 degrees, select Closed if you want the object to appear solid from all sides, or Open for a hollow appearance. You should make sure the first and last points set (and connect) are vertically aligned, or have the same X coordinate (use the Coords On command in the View menu) for true left-right symmetry.

• Finally, click on Sweep or Spin, then close the Mold requester by clicking in the close gadget in the upper left corner of the requester to perform the spin. If the results are unacceptable, use the Undo command (Right Amiga-U) to retry. Remember the distinction between Sweep and Spin--Sweep spins all points in the object, while Spin spins all but the first and last points in the object.

Story

Story is one of the most powerful commands in Silver. It lets you perform 'path' and hierarchical animation, as well as set a path for extruding objects. You can also use Story to rotate and/or scale objects during an animation.

In path animation you first create motion paths by connecting strings of points with edges, then assign one or more objects to it with the Story command. You then use the Animation editor to assign the animation to a number of frames to determine its length. The number of frames need not match the number of points in the path; Silver interpolates smoothly in any case. You can also use the Story command to assign objects to other objects which are assigned to paths, thus creating hierarchical motion. An example of this is the whirling rotor on a forward-moving helicopter. You would simply assign the chopper to a path indicating direction, then set the rotor to follow the chopper object and rotate so many degrees per frame with the Relative setting.

After picking an object to be animated (the object should be blue), select the Story command from the Settings menu. This requester appears:

```
┌────────────────────────────────────────────┐
│ □ Story: CUSTOM DISK                        │
├────────────────────────────────────────────┤
│                                            │
│  Follow Path: ███████████████████          │
│                                            │
│  X Rotation: ██ 0.000 ██  X Scaling: ██ 1.000 ██  │
│  Y Rotation: ██ 0.000 ██  Y Scaling: ██ 1.000 ██  │
│  Z Rotation: ██ 0.000 ██  Z Scaling: ██ 1.000 ██  │
│                                            │
│     Abs ☒   World ☐       Abs ☒ World ☐    │
│     Rel ☐   Local ☒       Rel ☐ Local ☒    │
│                                            │
│     ☐ Y Align   ☐ Follow Me   ☐ Drop Story │
│                                            │
└────────────────────────────────────────────┘
```

Story Requester

Note that the object's name appears at the top of the requester next to "Story:".

Following is a discussion of each item in the Story requester:

Follow Path

To assign an object to a path, along which it will move during an animation or for an extrusion by path, enter the name of the path in this field in the object's Story requester. Remember, a path must consist of a set of points connected linearly by edges, and must have a unique name. Or, if you enter the name of another object here, the first object will follow the second object (the one named in its story) wherever it moves during the animation.

Rotation

As part of an object's story--that is, the animation to be performed--you can set the object to rotate around its axis with respect to the local or world X, Y, and/or Z axes. The Abs setting stands for Absolute rotation, in which the object rotates the number of degrees set in the requester over the course of the entire animation. In other words, if an object rotates 360 degrees with Abs set over a ten-frame animation, it rotates 36 degrees per frame.

On the other hand, the Rel setting indicates relative rotation. That is, the object rotates the indicated amount per animation frame, no matter how long the animation.

Scaling

Setting a scaling amount other than 1.000 for any combination of axes causes the object to change size steadily over the course of the animation. As in Transformations scaling, objects can be scaled with respect to its own or the world orientation. And as with Story rotation, the Abs (absolute) setting causes the set transformation to occur over the entire course of the animation, and the Rel (relative) setting causes the settings to be applied repeatedly in each frame. For example, an X Scaling amount of 2 applied relatively with the World setting would cause the object to double in width (as viewed from the front) in each frame of the animation.

Align to Y

This applies to path animation as well as extrusion by story (see Mold above). It's useful for paths that aren't horizontal when viewed from the front or side. When this function is turned on, objects align their Y (in/out) axis to the path direction at every point on the path, rotating to

maintain a consistent orientation with respect to the path direction. This is particularly useful with path extrusion for maintaining constant thickness of the extruded object. It's also useful for depicting animation of objects that continually turn to point in the direction they're moving, such as missiles and airplanes.

Follow Me

An object set to follow a path with the Follow Me setting active causes any objects grouped to that object ('child' objects) to follow the same path in subsequent frames. A common example would be locomotive engine pulling several train cars behind it. But in Silver you can make the train (or any other group of objects) move along a spiral (or any other) path!

Here's a step-by-step example for using Follow Me:

1. Create a new file and double click on Frame 000 to enter the Key Cell object editor.

2. Create a path: use Add Axis, then add several points, then connect them in a line with edges. Use the Attributes requester to give it an appropriate name (such as 'Path'). For more detailed information on creating a path, see 'More about Story' directly below.

3. Now create the object that's to 'pull' the other objects-- we'll call it Engine. Use any simple shape, such as the Cone from the Edit menu Add Custom requester.

4. Pick the engine, then activate the Story requester by selecting Story from the Settings menu. Type Path (or the name of the path object) in the space in the requester next to 'Follow Path'. Click in the box next to 'Follow Me' so an X appears in it, then close the requester.

5. Now create a few other simple objects and group them to the Engine object. To do so, pick all the objects (so they turn blue) while holding down the left shift key, **starting with the Engine.** Then select the Group command from the Edit menu or press Right Amiga- G.

6. Now exit the object editor to the animation editor, and set up an animation. While holding down the left Shift key, click once on Frames 1 through 8. Next invoke the Make command from the Cells menu. Click on Frame 000 to select it, then select Source from the Cells menu. Next select Use Story from the Cells menu, then All from the Edit menu. Then select Target from the Cells menu, and Wire Frame from the Options submenu in the Display menu. Finally, use All again, then Make Scene from the Scene menu.

7. The animation should take no more than a minute or so to render. To view your wireframe test animation, use Load Scene from the Scene menu, then Play Scene (Once or Loop).

Drop Story

To prevent an object from being assigned to a path or another object during an animation, pick the object, select the Story command, and click on Drop Story. The requester automatically closes.

More About Story

Although the Story command is in the object editor, use of it requires that you understand the Animation Editor Reference section of this manual.

Here's the basic procedure for performing Story animation in Silver:

• Create a new file and double click on Frame 000, which is the Key Cell in the center of the lower half of the screen. This places you in the Object Editor for the Key Cell.

• Create a path by adding an axis (name it Path or somesuch when the Rename prompt appears), picking it by pressing F1, then adding several points along a path that an object is to follow. The more points you add, the more detailed the movement. You can add points anywhere in Silver's world from any view, changing the placement on the in/out axis with the Set Depth command in the View menu.

• Connect the points with the Add Edge command to create a continuous path.

• Pick or create (then pick) an object to follow the path.

• Select the Story command from the Settings menu.

• When the Story requester appears, type the name of the path you entered in step 1 in the box labeled Follow Path. Also enter any rotation or scaling information. Click on the requester's close box to set the story.

• Now exit the cell by clicking on the close gadget in the upper left corner.

• Determine the number of frames the animation is to take. If the required number of cells isn't present, use the Make command on them. The Key Cell is never included in the animation. If necessary, select empty frames and use the Make command (using the left Shift key lets you select multiple frames). As a guide, at full speed Silver displays 15 frames per second.

• Select the Use Story item from the Cells menu (unless the item is already checked in the menu).

• Select Frame 000, the Key Cell, and select the Source command from the Cell menu or press Right Amiga-S.

• Now select all the frames over which the animation is to occur with the All command--press Right Amiga-A.

• Select the Target command from the Cells menu or press Right Amiga-T. This tells Silver to apply the story to all the Target cells. The disk drive is busy for a few seconds, then the pointer reappears.

• At this point it's a good idea to go into several or all cells to make sure the animation is working properly. Each cell's workspace should reflect its point along the animation sequence.

• For a quick run-through of the animation, choose Wireframe from Options submenu of the Display menu.

• Select the loop point cell (usually #1) and select the Loop Point command from the Scene menu.

• Select all cells in the animation (Right Amiga-A for all).

• Select Make Scene from the Scene menu.

• When the mouse pointer turns back from 'Busy' to the arrow, you can load and view the scene with Scene menu commands.

Animation Hints

If you followed the above tutorial about using the Story command, you know that the actual animation is created when you use the Target command (with Use Story activated) to create a sequence of cells each of whose objects is slightly changed from the previous frame. Of course, you can set up a number of different animations at one time in a cell, but normally they all take place over the same number of cells (that is, those cells you select before using the Target command). If you want to create

animation sequences of different lengths in one Scene, use the Merge
command. After using the Source/Target commands the first time, clear
the Key Frame of all objects, then create the new Story sequence, then use
Source/Join. This serves to combine the new animation with an existing
one.

Load (Right Amiga-L)

This Settings menu command activates a File Selector that lets you choose
the name of a disk file contain objects or groups to load into the
workspace. When loaded objects appear orange--to move them, press F1
to Pick them, then F1 again or Right Amiga-M to Mark them, then click
on the new location.

Save (Right Amiga-S)

After picking objects or groups to save to a disk file, use this command to
activate the File Requester. Use the techniques outlined above in the File
Requester section to set the path and name the file, and click on Okay to
save it. Objects from different animations can be combined with each
other by use of the Save and Load commands.

eXternal (Right Amiga-X)

Use this command to force Silver to store only one copy of an object with
saved cells on disk. This is useful for saving disk space when using
complex objects in animations. As explained elsewhere, Silver uses a
virtual storage system which causes each cell's contents to be stored
separately on disk. Complex objects cause cell data files to be quite large,
and using the same object in a series of cells can use up disk space
quickly.

An external object must exist as a separate file on disk, and you must load

it into each cell in which it's to be used. Here's the basic procedure for
making an existing object external:

• Pick the object and use the Save command to store it in a disk file.

• Delete the object from the Object Editor workspace.

• Select the eXternal command

• The file requester to load an object appears. Select the object file for the
external object, whereupon it's loaded.

• From then on the program uses the external file to store that object for
all cells into which the object is loaded with the eXternal command. If
you change the object, you must save it again to the external file.

Brush Menu

This command, one Silver's most powerful, lets you apply any IFF
bit-mapped image, including high-resolution and HAM, to any object.
The image, called a brush, can be either laid flat or wrapped around the
object's contours. This is sometimes called as texture mapping, although
in Silver a texture is a special case (see Texture Menu below). Judicious
usage of IFF brush wrapping can lead to some truly spectacular results.
You can have up to eight IFF brushes per cell. In animations, if you have
enough disk storage, you can use eight different brushes per cell, giving
you the possibility of having eight 'movies' playing inside your 3D
animation! In addition, you can assign IFF brushes to light sources,
letting them act as slide projectors.

One way to conceptualize 3D brush mapping is to think of a flag wrapped
around a large inflated beach ball. Silver can do this with any flat image
and any shape, and automatically takes care of the folds, wrinkles, and
loose corners.

To wrap an IFF brush around an object, load it into an axis which is
defined as a brush in the Attribute menu, set the wrap, resize it, then
Group it and Cluster it to the destination object. Here's a step-by-step
basic procedure--refer to the command reference below for details.

• Create the object that the brush is to wrapped around.

• Use the Edit menu to add an axis to the workspace.

• Pick the axis (so it turns blue).

• Set the axis to Brush coloring with the Attributes requester.

• Resize the X and Z dimensions of the axis so it's as large in relation to

the object as you want the image to be.

• Use the Load command from the brush menu to assign an image to the axis.

• Group the axis to the object to be wrapped, with the axis as parent. In positioning the axis in relation to the object it's important to remember that the image is loaded onto upper right quadrant of the plane defined by the axis' X and Z axes, that is with its lower left corner at the source as shown below:

Z

This is the area that the IFF brush will cover using Flat X Flat Z wrap.

Notice where the Axis is placed

X

Origin
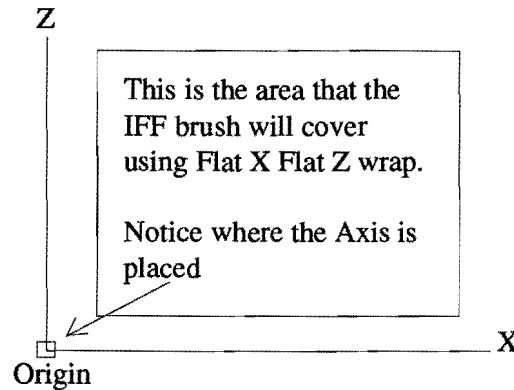
Make sure to place the axis in this physical relationship to your object or the image may not wrap properly.

• After grouping the axis as parent to the object to be wrapped, make sure the group is picked and use the Cluster command (Right Amiga-K).

• Use the Wrap command to set whether the image will lie flat or follow the object's contours.

Hints for Image Wrapping

It's usually a good idea, at least when initially experimenting, to make
your brushes (axis) slightly larger than the surface area of the object to be
wrapped. Also be careful in placing the axis with respect to the object--as
in dropping a cloth over a table, if you're too far to one side part of the
table is left bare.

IMPORTANT NOTE: Make sure not to set blending above about 25 for
objects wrapped with IFF brushes, or else the images will mush together
and be unrecognizable. For details see Blending under Attribute Menu
above.

IFF Brush Objects as Light Sources

An object which is set to both As Sun or As Lamp and IFF Brush in its
Attributes settings can act as a slide projector, beaming its image onto
nearby objects. Just as an object's shape determines how it casts light, the
shape determines the direction in which the image is cast. In the case of a
sphere, the image is cast in all directions about the object. The only object
that can't project an IFF Brush is the special Surface object in the Edit
Add submenu.

Note: For IFF Brush/light source objects you needn't load the brush onto
an axis first--simply load the brush directly onto the object.

Load

This command lets you use a file requester to assign an IFF picture file
name to a picked object (usually an axis) as well as to one of the eight
slots under Loaded Brushes at the bottom of the Brush menu. These slots
start out empty, each with the entry '--Unused--'. To load a brush, follow
this procedure:

- Set an object, usually an object, to Brush coloring via the Attributes requester. Make sure the object is picked.

- Select one of the brush slots so that a check mark appears next to it.

- Then select Load from the Brush menu.

- Select a picture file name from the requester to place it in the checked brush slot under Loaded Brushes. Note that this command doesn't actually load the brush; that doesn't happen until the scene is rendered. To inspect a brush use the View command below.

Drop

This command lets you free up a Brush menu slot under Loaded Brushes so you can load a different one. Select the brush slot so a check mark appears next to it, then select Drop from the Brush menu. The word '--Unused--' now appears where the brush file name was.

View

To view any picture file loaded into the Brush menu under Loaded Brushes, select it first so that a check mark appears next to it, then select View from the Brush menu. The screen goes black and the file is loaded and shown. Click the mouse's left button to return to the editing screen.

Wrap Submenu

This submenu gives you four choices--Flat X, Wrap X, Flat Z, Wrap Z--of which only two can be active at a time. There are four ways of wrapping a flat image around a three-dimensional object, derived from the four combinations available in this submenu:

Flat X Flat Z
Flat X Wrap Z
Wrap X Flat Z
Wrap X Wrap Z

These four are depicted below:
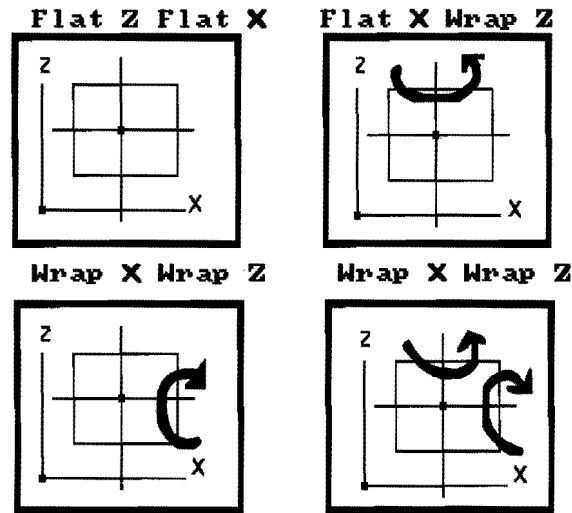
The axis into which the brush is loaded should always be positioned
slightly below and to the front, as viewed from the front, of the object to
be wrapped. To apply the brush as flatly as possible without wrapping at
all, select Flat X Flat Z. To wrap the brush as around a vertical cylinder
such as a standing Coke can, use Flat X Wrap Z. To wrap the brush as
around a horizontal cylinder such as a lying Coke can, use Wrap X Flat Z.
And to wrap in both dimensions, use Wrap X Wrap Z. Naturally you're
free to experiment here as elsewhere, and it's actually in your best interest
to play around with brushes as even we haven't yet discovered all the
possibilities!

Stencil Menu

Stencils are similar to brushes in that they originate outside Silver in paint programs such as Impulse's Diamond and Deluxe Paint II. However, they're not wrapped around other objects, but loaded as free-standing solid shapes in Silver. Stencils don't contain any color themselves, but you can apply any of Silver's object attributes to them, including loading IFF brushes onto them. The main restriction with Stencils is that they must be two-color (one bitplane) images, containing only palette positions 0 and 1. When loaded into Silver, the background color in these images becomes transparent while the foreground color is able to take on standard Silver object attributes. While stencils don't have actual thickness, they are solid and cast shadows.

Here's the method for creating a stencil:

• Create a one-bitplane picture in a paint program and save it to disk. If using Deluxe Paint II, set it to any resolution with **two** colors at the initial prompt.

• Start Silver, open a file, and go into any cell.

• Use the Edit menu command Add Stencil to create a new stencil.

• Pick the stencil by clicking on it or pressing F1 so it turns blue.

• Stencils start out lying flat. To turn it so you can easily see it from the front view, select Rotate World Axes from the Group (Object) menu and rotate 90 degrees on the X axis.

• Set the stencil to the size you want with the Size and/or Scale commands in the Group/Object menu.

• Select Load from the Stencil menu, and select the name of the file from step 1 with the file requester.

• You can now apply any standard attribute or resizing to the stencil. The file is loaded during rendering of the image.

Load

This command lets you use a file requester to assign an IFF picture file name to a picked stencil object as well as to one of the eight slots under Loaded Stencils at the bottom of the Stencil menu. These slots start out empty, each with the entry '--Unused--'. To load a stencil, select one of the stencil slots from the Stencil menu so that a check mark appears next to it, then select Load from the Stencil menu. Choose a picture file name from the file requester that appears to place it in the checked stencil slot under Loaded Stencils. Note that this command doesn't actually load the stencil; that doesn't happen until the scene is rendered. To inspect a stencil use the View command below.

Drop

This command lets you free up a Stencil menu slot under Loaded Stencils so you can load a different one. Select the stencil slot from the Stencil menu so a check mark appears next to it, then select Drop from the Stencil menu. The word '--Unused--' now appears where the stencil file name was.

View

To view any picture file loaded into the Stencil menu under Loaded Stencils, select it first so that a check mark appears next to it in the Stencil menu, then select View from the Stencil menu. The screen goes black and the file is loaded and shown. Click the mouse's left button to return to the editing screen.

Texture Menu

A texture is a user-defined and user-alterable pattern that is applied uniformly to the entire surface of a solid object in Silver. An example of a texture is a checkerboard, supplied on the program disk in a file called Chex. You can set the size and color of the checkers with this menu.

Other textures may be supplied on the program disk. You can find out more about them by loading them onto objects and using the Info command from this menu. Also, Impulse Inc. will release into the public domain the information and/or software necessary for Silver users to create their own textures.

Load

This Texture menu command lets you load texture files onto objects in the Object Editor workspace. You must first set the object to Texture coloring via the Attributes requester, and of course the object must be picked. Select the Load command, then select a texture file from the file requester that appears. If you move the file to another disk or directory you may need to move texture files as well, and reselect them with this command.

Drop

This command lets you free up a Texture menu slot under Loaded Textures so you can load a different one. Select the texture slot from the Texture menu so a check mark appears next to it, then select Drop from the Texture menu. The word '--Unused--' now appears where the texture file name was.

Info

This command shows the parameters necessary for the texture to function
properly. Set the parameters with the Parameters command, below. Pick
the textured item before choosing the Info command.

Parameters

The Parameters requester contains a number of numeric entry fields for
entering the information specified in the Info command for a texture. Pick
an object that's been set to Texture coloring via the Attributes requester,
and has had a texture loaded, and enter the required information in the
first column, then in the second if necessary.

For example, the sample Checks checkerboard texture supplied on the
program disk requires four parameters; size and RGB values for the
checker pattern, which you should enter in the first four fields in the left
column of the Parameters requuester. The size should be a multiple of 32
(e.g. 64, 128, etc.) and the RGB values should be between 0 and 255 in
the order red, green, blue. The other checker color is taken from the
textured object's original coloring.

Pick Menu

Use this menu to set the current Pick mode. If nothing is picked you can pick only groups and objects which turn blue when picked. Once you've picked an object, you can activate Pick Point, Edge, or Face to pick parts of the object for changing shape or setting attributes.

There are a number of ways of picking objects, as outlined in the section 'Selecting Objects' above. To reiterate slightly here, the easiest way to pick an object is to click the mouse pointer on its 'hot spot', or axis center. You can pick multiple groups, objects, points, or faces by holding down the left Shift key, which causes the message 'Multi' as well as the current number of picked entities to appear at the top of the screen. Once a group, object, point or set of points, or face or set of faces is picked, click again on any one to turn everything green and relocate picked items to any new spot that you click on. By relocating an object's faces, you're actually relocating its axis.

Group (Right Amiga-1)

While in Pick Group mode you can pick groups or non-grouped objects by clicking on them or with the other methods outlined in 'Selecting Objects' above. To pick a group, click on the parent object, or the object that's tied to all the others by purple lines. Picked groups and objects turn blue. You must pick an object before you can pick its faces or points.

As indicated, you can pick single objects while in Pick Group mode. However, to independently manipulate a group's parent object, you must pick the object in Pick Object mode.

To move a group of objects interactively, pick the group, then click again on the parent object's axis (or press function key F1)--the group turns

green. Then position the mouse at the new location and click the left
button.

Object (Right Amiga-2)

While in Pick Object mode you can pick objects by clicking on them or
with the other methods outlined in 'Selecting Objects' above. Picked
objects turn blue. This mode is particularly useful for manipulating
individual members of grouped objects. You must pick an object before
you can pick its faces or points.

To move an object interactively, pick the object, then click again on the its
axis (or press function key F1)--the object turns green. Then position the
mouse at the new location and click the left button.

Point (Right Amiga-3)

You can only enter this mode if an object is currently picked. Use Pick
Point to perform physical transformations on parts of objects. While in
Pick Point mode you can pick points by clicking on them or with the other
methods outlined in 'Selecting Objects' above. Picked points turn red.

To move points in an object interactively, pick the object, then enter Pick
Point mode. Click on any point--it turns red--(or use Multi mode to pick
several points) then press Right Amiga-M (Mark)--the object turns green.
Then position the mouse at the new location and click the left button.

Face (Right Amiga-4)

You can only enter this mode if an object is currently picked. Use Pick
Face to change attributes such as color of different parts of objects, or to
relocate an object's axis. While in Pick Face mode you can pick faces by

clicking on points or with the other methods outlined in 'Selecting
Objects' above. Picked faces turn red.

To move an object's axis, pick the object, then enter Pick Face mode, pick
any face, press Right Amiga-M (the entire object turns green), then
position the mouse at the new location for the axis and click the left
button.

Edge (Right Amiga-5)

You can only enter this mode if an object is currently picked. Use Pick
Edge to pick a path of edges circumscribing an object for dividing with
the Split command. While in Pick Edge mode you can pick edges by
clicking on points or with the other methods outlined in 'Selecting
Objects' above. Picked edges turn red.

Add Select (Function key F1)

This command functions identically to a press of the F1 function key. If
an group or object (or part of an object) is selected, this command causes
the selected item to be picked.

Rem Pick (Function key F2)

The Remove Pick command functions identically to a press of the F2
function key. If an group or object (or part of an object) is picked, this
unpicks the item. If more than one item is picked (Multi Mode), each
time you select Rem Pick or press F2 the items are unpicked in the reverse
order of that in which you originally picked them.

Rem Select (Function key F3)

If a group or object is currently picked, using Remove Select causes the
group or object to be selected (turns orange). If an edge, point or face is
picked, the item becomes unpicked.

View Menu

This menu is most commonly used for viewing the workspace from different angles. Once you start building complex scenes, you'll also need the flexibility offered by some of the View menu's other commands such as zoom and wireframe preview of the scene from the camera angle. The Coords On command is a handy way of lining up points for symmetrical or square objects.

Pan Mode--The Arrow Keys

Special Note: The arrow keys on the Amiga's keyboard are an important View control not found on the View menu. You can scroll or 'pan' the scene in the direction indicated by pressing one of the arrow keys. This is useful to give yourself elbow room for moving the camera back, for example.

Top View   **(Function key F8)**
Front View   **(Function key F9)**
Right View   **(Function key F10)**

These three show the workspace from above, from in front, and from the right side respectively. The usual working view is from the front. As it's difficult to visualize Silver's three- dimensional space on a flat monitor screen, you should switch often between the three views to get a better idea of physical relationships between your objects. This is especially important when repositioning objects, since two objects that look close together from one angle can be revealed to be far apart from a different view.

Wire Frame (Right Amiga-W)

The Wire Frame command gives you an ultra-quick 'pencil sketch' of all objects in view of the camera as they will appear in the final rendering of

the current cell. This view only shows objects' outlines, not shading,
coloring or other attributes. To exit from the wire frame view after the
scene is drawn, position the mouse arrow anywhere in the window and
click the left mouse button. Also, if you click while the wire frame view
is being drawn, the drawing stops after the current object--click again to
exit the view.

Zoom In   (Right Amiga-I)
Zoom Out   (Right Amiga-O)

Zoom In enlarges the view and Zoom Out makes everything smaller, both
starting from the center of the view. Use Zoom In to eliminate extraneous
details when working on part of a scene and Zoom Out to get an overall
view of the scene. Use Reset at the bottom of the View menu to return to
the original zoom level.

Before zooming in on an object it's a good idea to center it in the display
using one of these commands; Find, Home, Next, Last. But if you lose an
object while zooming in on it, remember you can scroll or 'pan' the
display by pressing any of the arrow keys to the right of the Return key on
your keyboard.

Coords On

This command opens a small window that always shows the current X, Y
and Z coordinates of the mouse cursor. This can be useful in precise
placement of points for extrusion or spinning, for example.

Set Depth

This command is primarily used in adding points to an object, and lets you
add points at any depth. Normally when you're working in a view, you
control point placement in that view's vertical and horizontal axes, but not

on the in/out (depth) axis. For example, when adding a point while in the Front view you can only set the point's location on the X and Z axes, but the Y (in/out) axis setting is always 0.

To change the location on the in/out axis at which new points are to be set, activate the Set Depth command from the View menu and type in a new setting. From that point on any new points that you add are located at that setting on the in/out axis. The new setting is retained even if you switch to another view, then back again. For best results, use this command together with the Coords On command (above).

Reset

This handy command saves you the trouble of manually zooming and panning back to the starting point after a length editing session. It instantly resets the initial zoom level and returns to the initial view.

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Animation Editor Reference

Introduction

The Animation Editor is the section of Silver in which you're always placed when you first start the program. It looks like an eight-frame filmstrip laid horizontally across the middle of the screen, with an extra frame positioned between two sliders labeled Frame Position and Delay/Frame near the bottom of the screen:

Frame 001 Cell	Frame 002 Cell	Frame 003 Cell	Frame 004 Cell	Frame 005 Cell	Frame 006 Cell	Frame 007 Cell	Frame 008 Cell

Start   Finish   Frame 000   Fast   Slow
Frame Position   Cell   Delay/Frame = None
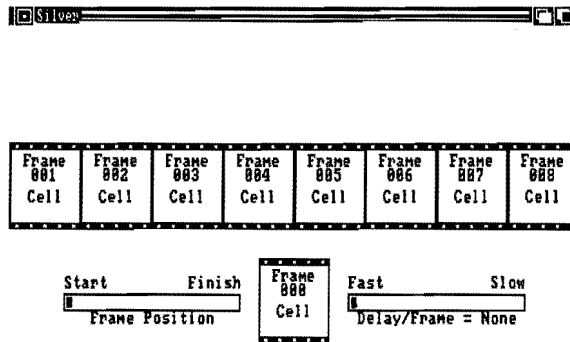
Animation Editor

From here you control all functions concerning image generation and animation in Silver, most of which are available from the menu and hot keys. The hot keys used here aren't the necessarily same as those used in the object editor, with the useful exception of Right Amiga-U; the Undo key.

The first step when creating a new image or animation is to set the graphics mode with the Modes menu. You can't change this after creating or opening a file, but it's easy to save entire cells and load them into other animations to experiment with different modes.

After setting the mode, use the New or Open command from the File
menu, then start editing a scene in any cell. To enter a cell click twice on
it. Once you've placed some objects in a cell, exit to the Animation
Editor to render a frame or animation with the Generate or Make Scene
commands.

It's important to keep in mind the difference between cells and frames
while using this reference. Cells contain objects, camera, and light while
frames are the final images rendered by Silver from a cell's contents, plus
the associated cell. The Animation Editor lets you manipulate cells and
frames independently with the Cells and Edit menu respectively.

Silver's Virtual File Storage

Silver uses a virtual file storage scheme to maximize memory and let you
create as complicated objects as possible in each cell. When you enter a
cell from the Animation Editor its contents (if any) are loaded from a disk
file, and when you exit from the Object Editor workspace the cell is saved
to its own file on disk. You can set the drive and directory (path) used for
this operation with the Cells item in the Animation Editor's Scene menu.
Despite this automatic backup system you should always use the Save
command to ensure that edited cells are safely stored on disk for future
reloading after closing the file.

The fact that different files are used for each cell means that if your cells
contain complex objects, disk space can get used up fast because the
multiple copies of all objects are normally saved. You can force Silver to
store only one copy of an object on disk with the **eXternal** command in
the object editor. See eXternal above, under the Settings menu in the
Object Editor reference section.

The Meaning of the Asterisk

Once a cell is rendered as an image, an asterisk appears next to the cell's number in any frames in which it appears. You can then reuse this image in any part of the animation with the Edit menu commands without having to render it again. This special capability of Silver's lets you create short loops in animations with tremendous time savings. However, if you enter a cell with an asterisk by double-clicking on it, then change any setting, you must render the cell again after exiting. Use the View command (Edit menu) to experiment with non-permanent changes to a cell.

For further information on creating animations with Silver, consult the Scene Menu section below.

Animation Editor Mouse Commands

To quit from the program click on the close gadget in the upper left corner of the Animation Editor's window. If you haven't saved any changes in an open file you're given a chance to return and save, but you're not forced to.

An unselected cell's lettering is orange. To select a cell for editing with animation editor commands, click once on it--the cell's lettering turns white. To select more than one cell at a time, hold down the left Shift key while clicking on the cells to be selected. Many animation editor commands, including Write, Info, Show, and Generate, work consecutively on multiple-chosen cells.

To enter a cell and edit its contents, click twice on it, or once if it's selected. This activates Silver's Virtual File storage system before entering the cell. To alter the Frame Position or Delay/Frame slider settings, click and hold on the slider, then move the mouse left or right to move the slider accordingly. To change either slider's setting one unit at a

time, click in the space next to the slider within the wide white hollow
rectangle.

Frame Position Slider

The Frame Position slider gadget in the lower left corner of the Animation
Editor screen lets you access frames not currently shown. Any file in
Silver can contain up to 999 cells (limited by disk space, not memory). Of
course, the final animation must be able to fit into memory or you won't
be able to play it back. By using Silver in conjunction with a video
recorder you can string together many shorter scenes into a major
production, which is of course the way the professionals do it.

To scroll horizontally through the 'film strip' one frame at a time, click in
the space on either side of the slider button gadget. To move more
quickly through the frames, click on the slider button and hold down the
mouse button while moving the mouse left or right to scroll backward or
forward. Whenever the mouse is still the screen display is updated to
show your current position in the 'film strip'.

Delay per Frame Slider

The Delay per Frame Slider (labeled 'Delay/Frame') in the lower right
corner of the screen lets you set the maximum playback speed for
animations generated by Silver. The slider lets you add a consistent delay
of between 1/60 and 1 second per frame in 1/60 second increments. You
can also vary playback speed interactively during playback with the
Amiga's function keys.

The initial setting with the slider gadget in its leftmost position is 'None',
which means that Silver plays back the animation as fast as possible,
about 15 frames per second. Moving this one position to the right, by
clicking to the right of the slider gadget within the white horizontal

rectangle containing it, sets the delay per frame to 1/60 second. Each
successive click to the right or left of the gadget adds or subtracts 1/60 to
or from the delay per frame. To move rapidly through the settings, click
and hold on the slider button while moving the mouse left or right to speed
up or slow down playback.

Key Cell

The extra frame near the bottom of the Animation Editor screen, between
the two sliders, is a special frame for use in animation. You can use it to
set up animated sequences, but it's never included in the sequences. You
can use the Key Cell to set up very complex animation sequences with
multiple objects with repeated use of the Source and Join commands,
clearing out the Key Cell each time before setting up a new animation.
See the Source, Target, Join, and Key Cell commands below for further
information.

Info Menu

Functions in this menu include basic information about this program and displays of available disk and memory space.

About

Displays a small requester showing the version of Turbo Silver you're using as well as Impulse, Inc.'s address and phone number.

Disk

This command shows a requester displaying the number of bytes free (i.e. available space) on all drives currently logged on the system.

Memory

This requester shows the amount of available chip RAM and fast RAM in your Amiga. Remember that Silver's virtual memory system lets you build as complex a scene as will fit in your computer's memory in each cell.

File Menu

Use this menu to perform basic file maintenance. Silver uses various types of files to store the different kinds of information it uses, but you need be concerned with only one file name per project, whether stills or animations, as long as you don't move files around. If your projects are small you can store several on a disk.

File Information for Advanced Users

When you first create a new file in Silver, for example Walk1, the program creates a file called Walk1.SCR and a directory called Walk1.CEL. The .SCR extension stands for Script--the main or script file is a text file that contains some information about the file, including path names for its various directories. Silver also generates an icon for the script file to remind you of the file's existence from the workbench.

The .CEL extension of the Walk1.CEL directory created by Silver indicates that the directory is to hold all Cell files. Whenever you double-click on a frame, if it doesn't have a cell number a new file is created in this directory.

When you first render cells in a new file, Silver creates a new directory in the same directory as the script file (unless otherwise directed with the Stills command in the Scene menu) called Walk1.STL, following our example. This directory contains all RGBN and ILBM pictures generated from the file. The image files are called RGBN.# and ILBM.#, with the image's frame number appearing where the # is.

Finally, when you first use Make Scene with a new file, Silver creates a directory called Walk1.ANI, which contains files assocated with the animation. Silver also generates an icon for the .ANI directory. To copy

the animation to another disk from the workbench, simply drag the .ANI
icon from the source window to the destination.

You cannot copy a Silver file to another disk from the Workbench by
simply dragging the script file icon. You must use the CLI or a disk
utility program to copy the .CEL directory, which doesn't have an icon, as
well. You should also copy the .STL and .ANI directories if you plan to
reuse previously generated stills and animations. Then, if you plan to use
the file from a drive or drives or directories other than that on which it was
originally created, you must use a text editor or word processor that can
save in ASCII format to edit the .SCR script file and change path names
for the .CEL, .STL, and .ANI files.

Say, for example, that you have an animation that you created on a disk in
floppy drive DF1:, and you want to transfer all files to a drawer named
Silver, which also contains the Turbo Silver program, on hard drive
partition DH1:. Normally in floppy drive usage you don't save files on
the same disk that you run Silver from, so Silver prefaces the path names
for the .CEL, .STL, and .STL directories with DF1: in the script file:

DF1:Walk1.CEL
DF1:Walk1.STL
DF1:Walk1.ANI

However, if you use the same disk, the drive specifier isn't necessary. So
if your files are in the same directory as Silver, all you need to do is
remove the DF1:

Walk1.CEL
Walk1.STL
Walk1.ANI

Or you could store them in a drawer in the Silver directory named for the
animation:

Walk1/Walk1.CEL
Walk1/Walk1.STL
Walk1/Walk1.ANI

But if you moved the directories to another partion or a floppy disk in a
different drive, you'd need to insert drive specifiers in the script file.

Note: If you use the Scene Menu commands (Cells, Stills, and Animation)
to change directories for the various types of files, any existing files are
lost.

New (Right Amiga-N)

Use this command when creating a new image or animation. When the
file requester appears use the mouse to select a drive and path, then type
in a file name. Don't use spaces or periods in the file name. Then click
on the OK gadget or press the Return key to begin editing. The file name
you entered appears near the upper left corner of the Animation Editor
window.

Open (Right Amiga-O)

Use this command to edit an file previously saved to disk and closed.
When the file requester appears use the mouse to select a drive, path, and
file. Then click on the OK gadget or press the Return key to begin
editing. The name of the opened file appears near the upper left corner of
the Animation Editor window.

Save (Right Amiga-S)

Use this command while editing a file to save a all information to disk
with the current filename. Be sure to perform a Save operation before
closing a file and/or exiting the program to preserve the latest changes.

Close

The Close command lets you quit a file without exiting the program. If
you've made any changes to the file Silver warns you via a requester.
Click on OK to go ahead and close the file without saving, or on Cancel to
abort the Close command.

Quit (Right Amiga-Q)

Use this command to quit using Silver and exit the program. A requester
appears asking you to verify the decision. Click on the Yes gadget to quit
or on the No gadget to remain in Silver. An alternative to this menu
command/hot key is to click on the close gadget in the upper left corner of
Silver's Animation Editor window.

Clean Up

As you edit cells and frames by cutting and deleting them, you must use
this command to tell Silver that the changes are permanent. Always use
Clean Up before closing your work.

Modes Menu

Use the Modes menu prior to using the New command to set the Amiga graphics mode (all are available) to be used in generating frames for the file. This menu is only accessible before using the New or Open commands to begin editing a file, so you can't change your mind and switch to a different mode while editing a file. However, it's simple to save the contents of individual cells and load them into other files to experiment with different graphics modes.

You can make four choices From the Modes menu: HAM, Lo Res, or Hi Res; 200 Line or 400 Line; Normal View or Overscan; and 12-bit or 24-bit RGB. Check marks appear next to active items.

HAM
Lo Res
Hi Res

This setting determines horizontal resolution and the number of colors available. HAM (Hold And Modify) and Lo Res (Low Resolution) both use about 320 pixels per scan line; Hi Res (High Resolution) uses 640 pixels per scan line for more detailed images. The main difference between these three is the number of colors available; 4096 in HAM, 32 in Lo Res, and 16 in Hi Res. The default (preset) mode is HAM simply because the wide range of colors available results in the most spectacular and realistic images possible. While HAM mode images take longer to generate than those using Lo Res mode, Hi Res images take longer than HAM mode.

200 Line
400 Line

This setting also determines screen resolution, but in a vertical direction.
200 Line is the default mode and is faster and flicker-free, but images can
appear slightly blocky. 400 Line uses the Amiga's interlace mode to
double vertical resolution and in many cases the flicker isn't
objectionable, but images take about twice as long to generate.

Normal View
Overscan

This setting determines whether or not there is to be a screen border.
Normal View uses a screen border, while Overscan extends the image
area to beyond the edges of most video monitors so there doesn't appear
to be a border. This is useful in Desktop Video applications where the
border is unacceptable. Overscan images require increased generation
time.

12-bit RGB
24-bit RGB

When you use Silver's Generate command to render a frame, the program
normally creates a 12-bit-plane RGBN image which can contain up to
4096 colors. When you display the RGBN image with the Show
command it's converted to IFF HAM format on the fly, which is why
loading an image may take a bit longer than normal.

If you select 24-bit RGB before creating a new file, rendered images can
contain as many as 16 million colors. However, the image files are
correspondingly larger--approximately 600K bytes each. Also, 24-bit
RGB images can only be displayed on Amiga frame buffers (special
display hardware). Frame buffers are available from Impulse, Inc. and
Mimetics Corporation.

Edit Menu

Use the Edit menu, which is accessible only after opening a file or
creating a new one, to edit frames and cells as units. The editing
commands in this menu act on the frames and cells as units. Edit menu
commands don't work on frames with no cell numbers. Similarly, since
the Key Cell can't be rendered as a frame, Edit menu commands don't
work on the Key Cell.

The Cut, Copy, Paste, and Delete commands all work on entire frames
and cells as units. This means that when you copy cells using this menu,
each copy, though related to a different frame, is a reflection of a single
cell. An example is helpful here: start a new file, enter cell 1, add an
object, then exit to the Animation Editor. Note that the number 1 appears
under the word Cell in Frame 1. The lettering in Frame 1 should still be
white to show it's selected; click once on it if it's not, then select the Copy
command from the Edit menu. Now click once on Frame 2 and select the
Paste command from the Edit menu. Note that the number 1 now appears
under the word Cell in both Frames 1 and 2, which means that the same
cell is used to draw both frames when rendered with the Generate or Make
Scene commands. You can demonstrate that the cells are identical by
entering either one, adding or changing an object, then exiting and
entering the other and noting that the change is consistent.

Select any frame for editing with Edit menu commands by clicking on it
so its lettering turns white. You can select multiple frames by holding
down the left Shift key (Multi mode) as you click on different cells. Use
the Frame Position slider to access cells not currently shown.

By judicious use of these commands you can add to an animation's length
without having to generate extra frames. For example, you can create a
bouncing ball by following this example:

1. Create a short animation of a ball moving up or down--say, five frames
or so. First click on cell 1 twice to enter the workspace and add a sphere.
Exit the cell, select frames 2 through 5 while holding down the left Shift
key, then use Make from the Cells menu. Select frame 1, then press Right
Amiga-Z (Source), then Right Amiga-A (All), then Right Amiga-T
(Target) to make four new cells each with a copy of the sphere. Then
enter each cell in turn and move the ball a little farther up or down than
the previous cell. This is just for illustration-- you can create complex
animations easily and automatically with Silver's Story command (see
Object Menu in the Object Editor Reference section).

2. Render the animation in Solid Model mode. When Silver asks to delete
RGBN files, click on the No gadget.

3. After rendering the cells, hold down the left Shift key and click on
frame 4, then on frame 3, and finally on frame 2. All three should now be
selected, showing white lettering.

4. Now select the Copy command from the Edit menu (Right Amiga- C).
The cells have been copied into the paste buffer in the order in which you
clicked on them; 4-3-2.

5. Click on frame 6, then use the Paste command from the Edit menu
(Right Amiga-P). This pastes frames 4, 3, and 2 after frame 5. The new
cell sequence is 1-2-3-4-5-4-3-2, although frames are numbered
consecutively.

6. Set frame 1 as the loop point and generate the scene (see Scene Menu
below). All frames are generated, and the new scene is created in a few
minutes. Load it (Load Scene) and play it back (Play Scene Loop) and
you'll see the animation of the ball bouncing up and down for which you
only needed to create the motion in one direction.

Again, the above example should serve only as an illustration of cut and
paste. You can create a back-and-forth effect as well as other far more
complex motions easily with the text file Movie contained in the .ANI
drawer. See Appendix C for further information.

All (Right Amiga-A)

Use the All command to select all active cells for a further operation.
Commands that can be applied to all cells include Copy, Cut, and Delete
from the Edit menu, Target and Join from the Cells menu, Show and
Generate from the Display menu, and Make Scene from the Scene menu.

Copy (Right Amiga-C)
Cut (Right Amiga-X)
Delete (Right Amiga-D)
Paste (Right Amiga-P)

As mentioned above, these commands make identical copies of frames in
order to reuse the images generated from them in different parts of an
animation without need for regeneration, and without replicating the
associated cell. The Copy command copies any selected frames into the
paste buffer in the order in which they were selected, while Cut deletes
them from the existing order after copying them into the buffer.
Successive uses of the Cut or Copy commands replace any previous
contents of the paste buffer. The Delete command simply removes frames
from existence. Any frames to the right of cut or deleted frames are
automatically renumbered to close up gaps in the numerical frame order.

To use the Paste command after first copying or cutting frames into the
paste buffer, select the frame into which to paste the cells, then select the
Paste command or press Right Amiga-P.

You can copy or cut frames into the paste buffer in any order using Multi

mode--that is, by holding down the left Shift key while clicking on cells in the desired order. For example, if you have frames and cells 1 through 10, you can copy frames 5, 3, 8, and 2, then paste them in that order.

Edit (Right Amiga-E)
View (Right Amiga-V)

Both of these commands allow you to enter a cell and alter its contents with the object editor. The Edit command functions identically to the action of double-clicking on a cell (or single-clicking a selected cell)--you enter the object editor for that cell. When you exit the edited cell, any changes are registered and saved to disk. If the cell had been rendered previously in Solid Model or Full Trace mode (an asterisk appears next to the cell's number in the animation editor), changing the cell causes the asterisk to vanish, thus rendering the rendered cell's image no longer accessible. Changing a cell means moving an object or activating a requester.

Use the View command to enter the object editor for a cell without making any permanent changes. That is, when you exit the cell any changes aren't registered, and if you've rendered an image for that cell you can still display it with the Show command.

Undo (Right Amiga-G)

Use the Undo command to reverse the effects of any Edit menu commands immediately after invoking them. This is a convenient way to recover from errors of judgement.

Cells Menu

The commands in the Cells menu let you make identical new copies of existing cells, as opposed to the 'reflection' cells created by the Edit menu. You can also combine cells, load and save them to disk, and set lengths for Story animations. Finally, the Info command tells you how long a cell took to generate.

As the Animation Editor screen only lets you view eight frames at a time, use the Frame Position slider gadget in the lower left corner of the screen to access other frames.

Make (Right Amiga-M)

The Make command lets you prepare new cells to receive information. Once you've made a cell, you can create new objects in it by entering the object editor for that cell. Or you can use Source and Target/Join to clone existing cells or set up animations.

Select any number of frames to be created by clicking on them, holding down the left Shift key to to select more than one, then select the Make command or press Right Amiga-M. Note that each new cell is numbered one higher than the previous one, in the order in which you clicked. You can also make cells one at a time by clicking twice on any empty frame, which places you in the the object editor for the new cell.

Key Cell (Right Amiga-K)

This command simply selects the Key Cell, which is always Frame 000. The Key Cell's most important use is as an accessory cell in creating animation. This is because when you use Source and Target/Join to generate animations, the Source cell is not altered to become part of the animation, even if it's designated a Target cell. Since the Key Cell is

outside the standard cell sequence and cannot be rendered, it makes sense to use it as a Source cell in generating animations. The animation created in such a case begins in the first Target cell, which is usually Frame 001.

In a new file you must use the Make command on Frame 000 (or click twice on it) before using the Key Cell.

Source (Right Amiga-Z)

The Source command lets you copy a cell's entire contents to any number of new cells. First select a cell, then use the Source command, then select any number of cells and use the Target command, described below. You can also merge (Join) the Source cell with any number of others. The Target cells must first be created with the Make command (above).

Although you should generally use the Key Cell, Frame 000, as a Source cell in setting up animations, any cell can be a Source. A source cell is never altered when setting up an animation, even if it's also one of the target cells.

Target (Right Amiga-T)

After using the Source command on an existing cell, use the Target command to copy that cell's contents to any other existing cells; that is, cells created either with the mouse-click Edit command or with the Make command. Select any and all cells to receive copies of the source cell, holding down the left Shift key to select more than one, then select the Target command or press Right Amiga-T. Target is a destructive command; any previous contents of selected cells are completely replaced by copies of the source cell's contents after using the Target command.

In setting up animated sequences, make sure the Use Story setting (below) is active before using the Target command.

Join (Right Amiga-J)

After using the Source command on an existing cell, use the Join
command to merge that cell's contents with any other existing cells; that
is, cells created either with the mouse-click Edit command or with the
Make command.. Select any and all cells to merge with the source cell,
holding down the left Shift key to select more than one, then select the
Target command or press Right Amiga-T. Each resulting cell then
contains its previous objects plus copies of all objects in the source cell,
all in their original positions.

In setting up animated sequences, make sure the Use Story setting (below)
is active before using the Target command.

Expert Tips

One ideal usage of the Join command is in creating very complex objects.
You can pre-subdivide the object as much as you like, creating each part
in place in a different cell, using the cooridinate system to align parts.
Silver's world coordinate system is, of course, consistent from cell to cell.
Finally, you can combine the parts with the Join command. Naturally it's
a good idea to use graph paper and pencil as aids in constructing complex
objects.

Another use of the Join command is in creating complex animations. You
can set up different stories (path animations) with different objects in the
Key Cell, then copy them to differenttranges of cells (clearinggthe Key
Cell before setting up each new animation) using the Join command so
that previous animations set up with Target or Join are not erased.

Load (Right Amiga-L)

The Load command lets you load a cell that was previously saved with the
Save command. Select an existing cell by clicking on it, then select Load
or press Right Amiga-L and use the File Requester to select a file to load.

Write (Right Amiga-W)

The Write command lets you save the cell that's currently selected to disk.
If no cell is selected the file requester doesn't appear. Click on the box
next to File in the file requester and enter a new name to save the cell
under a different name. You can use this command to combine objects
and cells from different animations,(as well as to try the same animation
in different graphics modes.

Info (Right Amiga-I)

The Info command lets you find out how long a cell took to generate in its
most recent rendering in the current work session.. This command only
works with frames that contain an asterisk, which means that there is an
associated RGBN image file. The Info data is not stored with a file, thus
is no longer present in a newly reloaded file.

Use Story

Select the Use Story menu item before using Target or Join on a series of
cells to create an animation using Story information from the Source cell.
Use Story is a setting rather than a command. When the Use Story mode
is active a check mark appears next to it and the Source, Target, and Join
commands use Story information from those objects in the Source cell for
which you've set up animations. Make sure that that the Use Story item
in the Cells menu is checked before you use the Target or Join commands

to 'spread' an animation contained in a Source cell over several Target cells.

As an example, if you've set up a path for an object to follow in frame 1, the animation's length is determined by how many cells you spread the cell over using Source, Target and Join. Since Silver's fastest playback speed is 15 frames per second, if you want an object's motion to last one second, you should:

1. Create a an animation in a Key Cell (see Story under Group Menu in the Object Editor Reference section).

2. Use Make on 15 cells.

3. Select the Use Story command if it isn't checked on the menu.

4. Use the Source command on the Key Cell from step 1.

5. Select all 15 cells, then the Target command from the Cells menu (Right Amiga-T).

At this point Silver creates an animation from the Story information in the Key Cell by implementing the changes you've specified in a gradual manner from cell to cell. Each cell is a little bit different from the last, and when viewed consecutively in rapid succession (i.e. Play Scene), the cells' rendered images create the illusion of three-dimensional animation.

Display Menu

Use this menu to create and display still images and sequences of stills, set various Animation Editor options, and a few other odds and ends concerning Silver's display.

Show

The Show command displays any RGBN image files associated with selected frames, as indicated by an asterisk next to the frame's cell number. Select the frames to be displayed--choose multiple frames by holding down the left Shift key--then choose the Show command to start the slide show. The images are shown in left- to-right order. After each picture loads and is displayed, click the left mouse button to go on to the next.

When a picture first starts loading Silver displays its 16-color (HAM and Hi Res) or 32-color (Lo Res) palette in the bottom left corner of the screen as a visual reference.

NOTE: To save any Silver image as an IFF file compatible with other Amiga graphics programs, press S while the image is being displayed with the Show command. The file is stored in the same directory as the RGBN file, the Stills directory, with the name ILBM.#, with # replaced by the frame number.

Generate

Use the Generate command to create RGBN still image files for any selected frames that don't already have associated images. Select the frame or frames to be generated, then choose the Generate command to begin the rendering process. A constantly updated information line near

the top of the Animation Editor window shows progress in terms of the percent of the picture completed. Once the icture has been generated, use the Show command (above) to view the results.

You can abort the generation process at any time by clicking the left mouse button. If you click during or immediately after the initialization process the generation is halted immediately. If you click when the image is less than half completed, a requester lets you confirm the abort or continue. However, if the image is more than 50% completed a different requester appears notifying you of this.

There are a number of Animation Editor commands you can use prior to Generate (or Make Scene from the Scene menu) that affect the final tracing, including Options, Set Zone, and Reset Zone (all from this menu). Also, you can use the Stills command from the Scene menu to save the RGBN files on a different drive, allowing you to maximize disk storage capacity.

Options Submenu

This submenu gives you three choices from six paired items; a check mark appears next to each of the selected items. Each of the options affects the results of the next Generate or Make Scene command.

All Cells
New Cells

The first choice lets you choose whether all selected frames are to be generated anew with a Generate command, or only those which haven't yet been generated; that is, they don't have an asterisk next to the frame number. The default condition is to generate only New Cells, which of course saves a good deal of time in the long run.

As an example, if you've just rendered part of a frame with Set Zone, an
asterisk appears in the frame and remains even if you use Reset Zone to
render the full frame. In such a case the program won't re-render the
frame unless you set All Cells, assuming that you haven't edited the cell.

When you're done experimenting and wish to create a final scene, even
though you may have already generated several stills from the sequence
it's a good idea to set Lock Palette (below) and regenerate all frames for
maximum consistency of image from frame to frame.

Free Palette
Lock Palette

Whenever Silver creates a new still image in HAM mode, it first
calculates an optimum 16-color palette from which all other colors in the
picture are to be derived. By using the first, or default setting this palette
can 'float' or change in each successive frame depending on the cell's
contents. Under certain conditions, however, this can lead to noticeable
inconsistencies between frames which show up as visual glitches in the
final animation. For the best-looking animations, at a slight cost in
rendering speed, use Lock Palette.

Wire Frame
Solid Model
Full Trace

These three determine the look and speed of rendering offthe Generate
and Make Scene commands. Wire frame is fastest but Full Trace looks
best. Solid Model offers a close approximation to the Full Trace look
with speeds slightly slower than Wire Frame.

To test object motion, scaling, and positioning in animations set this final

Options submenu choice to Wire Frame, then select all cells and use the Make Scene command from the scene menu. The wire frame animation is rendered almost immediately, and gives you a good idea of how the final animation will look. Wire Frame doesn't work with Generate, only with Make Scene. To view a cell in wire frame mode, enter the object editor for that cell and press Right Amiga-W.

The default setting is Full Trace, which performs ray-tracing with all special effects and uses the full palette available for shading. When you select Full Trace, the Pixel Size requester appears (see below). Full Trace images take the longest, but final image quality is highest.

Silver can also perform Solid Modeling, which is much faster than ray-tracing but with Silver's special 'smooth-surface' version of solid modeling can look very similar to ray-traced images. Although you can use Set Zone with Solid Model, in many cases generation time isn't shortened by a significant degree. Some of Silver's attributes effects, such as reflectivity, shadows, and stencils aren't yet available in Solid Model mode, but we're working on it!

Full Trace
Pixel Size

Select the Full Trace item from the Options submenu with the mouse (even if it's already selected) to bring up a Pixel Size requester showing the default size of 1 pixel. By changing this to a larger size--we suggest not bigger than 5--you can speed up frame generation considerably, at the cost of resolution. Pixels even in the 2 and 3 size appear large and block, but in most cases these settings are useful for testing gross shading effects. Press the Return key or click on the requester's close gadget to set the new pixel size. Incidentally, the mosaic effect that results from settings larger than 1 can be useful for special effects.

Set Zone
Reset Zone

The Set Zone command lets you set a window of any size anywhere on
the screen outside of which no image is generated when the Generate or
Make Scene commands are used. This is useful for speedy rendering of
specific localized areas. The zone stays set for all cells until changed or
reset. Even in Overscan mode you won't be able to set the zone outside
the normal screen borders. Use Reset Zone to set the rendering area to
that established by the current Modes menu setting (Overscan or Normal).

When you select this command you're transferred to a blank screen that
shows the current mouse coordinates in a constantly updated display in
the upper left corner. Click the left mouse button when the pointer is at
the upper left corner of the desired rectangle, then again at the lower right
corner. You needn't hold down the mouse button in between. A
'rubber-band' rectangle guide follows the mouse after the first click to
show the zone. Write down these coordinates (before the second click) as
a guide for future adjustments in the zone.

HINT: To determine where to place the zone, enter the cell and press
Right Amiga-W for a wire-frame view of the final image. Place 'Post-It'
stickers or other light adhesive labels on the screen where you want to
render, then exit the cell and use these visual aids to set the zone.

Hide Silver

The Hide Silver command lets you take advantage of the Amiga's
multitasking capability, placing the program's screen rearmost in the
hierarchy of currently active Intuition screens. If no other programs are
running you're placed at the Workbench, or if you ran Silver from a CLI
or other command interface you're returned to that environment.

Display Menu

To return to Silver, use the Push gadget immediately to the left of the Pull
gadget in the Workbench's window's upper right corner or press Left
Amiga-N or Left Amiga-M. The Left Amiga key is the Commodore key
on some Amiga machines.

Scene Menu

This is the control center for Silver's animation housekeeping. From the Scene menu you can set paths for Silver's cell, still, and animation files, as well as various commands for creating and displaying animations.

Cells
Stills
Animation

These first three commands on the Scene menu allow you to redirect disk storage of Silver's three different types of directories. When you use the New command to open a new file, Silver creates a .SCR file with an icon and a .CEL directory without an icon with the file requester, both with the file name you enter (e.g. Sequence.SCR and Sequence.CEL). When you first use the Generate or Make Scene command, Silver creates a stills directory with the extension .STL, and when you first generate an animation with Make Scene a .ANI directory is created (e.g. Sequence.STL and Sequence.ANI). All three directories are created in the same directory used for the .SCR main file unless you tell the program otherwise with these commands.

Therefore it's important that you redirect any file storage before performing the appropriate action (such as creating cells for the .CEL directory, or generating frames for the .STL directory). If you use any of these after the corresponding directory has been created, any files in the previous directory are no longer accessible. Also, if you use the CLI or a disk utility program to move your files, you must use a text editor to edit the .SCR script file to tell Silver where they are, not use these commands. If you do use these commands to point to information-containing directories in new locations, any existing information is lost. The program warns you of this fact and gives you a chance to cancel.

To redirect files, select the type of file (Cells, Stills, or Animation) to invoke a requester that shows only directories on your drive, and select the drive and/or subdirectory into which to store the files. After choosing a parent directory with the mouse, you can type a directory name at the right end of the text in the DRAWER line in the file requester. When conserving disk space, keep in mind that usually the Stills folder contains the largest amount of data, the Animation directory contains the next largest, and the Cells directory usually contains relatively little data, although cells containing complex objects can be quite large. You can use the eXternal command (see Object Editor reference above) to save disk space with complex objects.

Set Loop

To set a loop point for an animation before rendering it with the Make Scene command, simply select the cell that's to be the loop point, then select Loop Point from the Scene menu. When you use Play Loop below, the animation runs once all the way through, the repeatedly returns to the loop point and runs through to the end again. If you don't set a loop point, a looped animation runs continually all the way through.

You can control looping more precisely by editing the Movie file in the .ANI directory. See Appendix C for details.

Make Scene

Use the Make Scene command to render animations. First select all cells to be used in the animation--use Right Amiga-A (All) to select every active cell, then activate Make Scene. Silver first **generates** any cells that don't have asterisks next to the cell number, then combines all the frames into an animation. To display the animation, use the Load Scene and Play Scene commands below.

The Make Scene command uses the Set Loop setting.

Since the Key Cell can't be rendered, it's never included in animations
even if selected when you use the Make Scene command.

Playing Animations Outside of Silver

You can play back Silver animations from the Amiga Workbench or CLI
(Command Line Interface) with the Player program, supplied on the
Silver program disk. From the Workbench, click once on the .ANI drawer
icon, which looks like a horizontal filmstrip with the word 'Scene'
superimposed. Then press and hold either Shift key, and click twice on
the Player icon. From the CLI, type:

Player filename

substituting the name of the .ANI drawer for 'filename'. Thus to play an
animation from file 'Walk1' you'd type:

Player Walk1.ANI

adding path names as necessary.

Incidentally, Turbo Silver 3.0 uses a new animation format, so previous
versions of the Player program won't work with animations from 3.0.

Generating Multiple Animations from One File

Whenever you use Make Scene, any previously generated animation in
the current cell is deleted. To generate multiple animations from a file,
follow this sequence:

• generate an animation

• close the file

• copy the file's .ANI directory to another disk or directory. You can use the Workbench to do this; just drag the icon to the destination disk or window. The icon looks like a small horizontal filmstrip with the word 'Scene' superimposed.

• reopen the file and generate a new animation

Make Movie

This command lets you use a special text 'script' file called Movie to generate complex animations. The Movie file must be present in the current file's .ANI drawer for this command to work. See Appendix B for information on the Movie file.

Load Movie

When you use the Make Scene or Make Movie command to generate an animation from a Silver file, the animation is created and stored on disk. Use the Load Movie to bring the animation files into memory so they can be played back--use the Play Movie command (below) to view the animation.

If you've created an animation that's close to or larger in size to the amount of free memory, you may not be able to play it back. In such a case, save everything, quit the program, and use the Player program (see Make Scene above) to view the animation. If the animation is equal to in size or larger than the total amount of memory in your system, you'll need to expand your memory before you can view it. To find the size of an animation, total the sizes of the files in the .ANI drawer.

Drop Movie

Use Drop Movie to remove an animation loaded with the Load Movie
command above from memory. Loaded scenes typically consume a good
deal of memory which could better be used for animation production, so
it's in your interest to always use Drop Movie after loading and viewing a
scene before continuing to work on the scene.

Play Movie Submenu
Once
Loop

The Play Movie command lets you view an animation created with the
Make Scene or Make Movie command and loaded into memory with the
Load Movie command. The Play Movie submenu gives you two choices;
Once or Loop. Choose the latter to run through the animation one time
and then return to the Animation Editor, or choose Play Movie Loop to
play back the animation continuously, running all the way through once
and then repeatedly from the loop point.

Press the Esc key to quit the animation. Don't forget to use Drop Movie
to clear memory before returning to rendering images.

Appendix A

The Silver Configuration File

When Silver first starts running it looks for a text file named **Silver.config** in the same directory from which it's run. If the file is found and its contents make sense Silver uses it to set a number of default settings, which you can control by editing this file. To edit the Silver.config file, use a text editor such as Ed, or a word processor that can save in ASCII format.

Here's an example of a Silver Configuration file, which contains only ASCII text:

```
BGRD 000
FGRD fff
SLCT f80
PNTS ccc
PRNT f0f
SPNT 0ff
PICK 00f
ACTV 0f0
PPNT f00
MODE 0
LACE F
NAME T
OVER F
WARN T
MULT 9999
SCRN 2
SETF 12  002
```

The first nine settings refer to colors used by Silver. Here's a brief explanation of each, followed by the default color setting:

BGRD - Background color (black)
FGRD - Foreground color, used by non-selected items (white)
SLCT - Color for selected objects and groups (orange)
PNTS - Color for points (light gray)
PRNT - Parent, used for lines connecting grouped objects (purple)
SPNT - Selected points (cyan)
PICK - Picked objects and groups (blue)
ACTV - Active, object ready for repositioning (green)
PPNT - Picked point (red)

The colors are determined by using three-place hexadecimal numbers to set the red, green, and blue values in left-to-right order. Thus, the value

RGB
f80

used to set the color of selected objects uses a red value of 15, a green value of 8, and a blue value of 0, which results in orange. In case you're unfamiliar with hexadecimal numbers, here's a table:

Dec.	Hex.
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

Dec. Hex.

Dec.	Hex.
9	9
10	a
11	b
12	c
13	d
14	e
15	f

The next setting in the configuration file is MODE, which refers to the first three settings on the animation editor Mode menu:

Mode Setting

Mode	Setting
HAM	0
Lo Res	1
Hi Res	2

The next setting, LACE, determines the default setting for Interlace; F (false) sets 200-line mode, and T (true) sets 400-line mode.

The NAME setting, also True or False, determines whether you're automatically requested for names of new items added with the Add menu.

The OVER setting, also True or False, sets whether or not Silver starts in overscan mode. If you're generating animations to be used in video production, you might want to set this to True.

The WARN setting determines whether warning requesters appear when you close a file or open another without saving first, after making changes to a file. Set Warn to True or False.

The MULT setting determines the maximum number of points, edges,
faces, or objects that can be picked at one time in Multi mode. The
maximum value of MULT is 9999. If you don't use Multi mode much,
you can save memory by reducing this number.

The SCRN setting, which can range from 2 to 8, determines the speed of
screen redraw. The higher the number, the faster the screen redraw.

The last line in the example Silver.config points to a way of customizing
Silver's operation for your particular way of working. The SETF
command lets you assign any Object Editor menu command to any of 20
function keys. The second set of 10 function keys is obtained by first
pressing the Esc key, then releasing it, then pressing the desired function
key.

Here's the format of the SETF command:

Cmd Key Menu# Item# Submenu Item#

SETF 12 002

The first number, 12, refers to the function key pressed to obtain the
particular menu function. In this case you'd press the Esc key, then F2.

The next number specifies which menu command is to be activated when
you press the indicated function key. Each digit in the three-place number
is a hexadecimal number. The first digit refers to the Object Editor menu
from which the command is taken. The second digit refers to the number
of the menu item. The third digit refers to a submenu item, if any. **In all
three cases start counting with 0.** So in the example above, the first
menu, #0, is the Edit menu, and the first item, #0, is Add. The third item
on the Add submenu, #2, is Add Axis.

Here's another example. If you use the Story command often for animations, you might wish to assign it to a function key--we'll use F14, which you get by pressing and releasing the Esc key, then pressing F4. Since the Story command is the seventh item on the third menu, and no submenu items are involved, this will do the trick:

SETF 14 260

As a final example using a hexadecimal number, to assign the Undo command to Esc-F6, use:

SETF 16 0B0

since Undo is the twelfth command on the Edit menu (#0), and B is the hexadecimal equivalent of decimal 11.

Appendix B

Movie

When you first render an animation in Silver with the Make Scene command, the program creates a text file in the current file's .ANI directory called Movie, which contains the default settings for the animation as specified in the Animation Editor. Since the Animation Editor deosn't let you specify extremely complex sequences, you can edit the Movie file to create sequences as complex as you like.

The procedure for using a Movie file is simple:

• Use Make Scene to create an initial animation and Movie file

• Edit the Movie file with a text editor

• Use Make Movie from the Animation Editor Scene menu to render the new animation.

As an example, say you use Make Scene to create a 12-frame sequence with the Animation Editor. The Movie file looks like this:

MOVIE
PLAY 1-12 FOREVER

Then, say you want to view the animation backwards. Instead of going through an extensive Animation Editor session reversing the order of the cells, you need simply use any text editor or word processor capable of saving an ASCII file to change the Movie file to:

MOVIE
PLAY 12-1 FOREVER

Then use the Make Movie command from the Animation Editor Scene command to render the reversed animation.

But what if you want to show the sequence forward, then backward, and have it cycle endlessly? In this case you can use the SCENE command,

Turbo Silver 3.0
Quick Reference Sheet
Animation Editor

General

Esc key - halts displayed animation
double-click on cell - enter cell for editing
F1 - F10   - set animation speed
S - press while rendered image is displayed
        (Show) to save as IFF file

Info Menu

Command	Shortcut
New	Right Amiga-N
Open	Right Amiga-O
Save	Right Amiga-S
Quit	Right Amiga-Q

Edit Menu

Command	Shortcut
All	Right Amiga-A
Copy	Right Amiga-C
Cut	Right Amiga-X
Delete	Right Amiga-D
Paste	Right Amiga-P
Edit	Right Amiga-E
View	Right Amiga-V
Undo	Right Amiga-U

Cells Menu

Command	Shortcut
Make	Right Amiga-M
Key Cell	Right Amiga-K
Source	Right Amiga-S
Target	Right Amiga-T
Join	Right Amiga-J
Load	Right Amiga-L
Write	Right Amiga-W
Info	Right Amiga-I

which sets up a 'subroutine' that you can call from the main MOVIE
program. Here's how to do it:

```
SCENE ABC
PLAY 1-12
PLAY 11-2

MOVIE
PLAY ABC FOREVER
```

In the above case, the program continuously plays frames 1-12, then 11-2,
which causes the animation to appear to cycle endlessly forward and
backward.

Finally, here's an example of a more complex Movie script:

```
SCENEABC
PLAY1-5
PLAY4-2

MOVIE
PLAY6-9
PLAY10-134 TIMES
PLAYABC
PLAY14-19
PLAYABC 2 TIMES
PLAY20-24 FOREVER
```

Note that in addition to playing a particular sequence of frames once or
continuously, you can specify a number of repetitions for any sequence.
In the above sequence, first frames 6 to 9 are shown once. Then frames
10-13 are shown 4 times, then the 'subroutine' ABC is played once. ABC
consists of frames 1 to 5, then 4 to 2 (backwards). Next frames 14-19 are
shown, then Scene ABC is shown twice. Finally, the sequence consisting
of frames 20 to 24 is shown continuously.

Turbo Silver 3.0
Quick Reference Sheet
Object Editor

General

Esc key - While wireframe view is being drawn, stops drawing after current object.

Edit Menu

Command	Shortcut
Add Point	Right Amiga-6
Add Edge	Right Amiga-7
Add Face	Right Amiga-8
Pick All	Right Amiga-A
Copy	Right Amiga-C
Cut	Right Amiga-X
Paste	Right Amiga-P
Delete	Right Amiga-D
Erase	Right Amiga-E
Join	Right Amiga-J
Split	Right Amiga-Z
Group	Right Amiga-G
Ungroup	Right Amiga-Y
Undo	Right Amiga-U
Quit	Right Amiga-Q
Escape	Right Amiga-]

Special Menu

Command	Shortcut
Free	Right Amiga-F
Track	Right Amiga-T
Apply	Right Amiga-A
Cluster	Right Amiga-K
Home	Right Amiga-H
Next	Right Amiga-N
Last	Right Amiga-B
Find	Right Amiga-F
Mark	Right Amiga-M
Redraw	Right Amiga-R

Settings Menu

Command	Shortcut
Globals	F4
Camera	F5
Transformations	F6
Attributes	F7
Load	Right Amiga-L
Save	Right Amiga-S
eXternal	Right Amiga-X

Pick Menu

Command	Shortcut
Pick Group	Right Amiga-1
Pick Object	Right Amiga-2
Pick Point	Right Amiga-3
Pick Face	Right Amiga-4
Pick Edge	Right Amiga-5
Add Select	F1
Remove Pick	F2
Remove Select	F3

View Menu

Command	Shortcut
Pan view	Arrow keys
Top view	F8
Front view	F9
Right view	F10
Wire frame	Right Amiga-W
Zoom in	Right Amiga-I
Zoom out	Right Amiga-O

SILVER

RAY • TRACING

3•D GRAPHICS
AND ANIMATION

AMIGA SOFTWARE
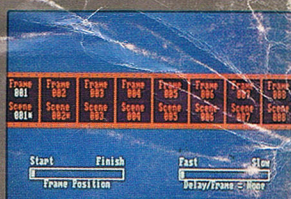
impulse inc.

Easy to use Object editor, makes manipulation of objects a very simple task. Uses keyboard and mouse commands.
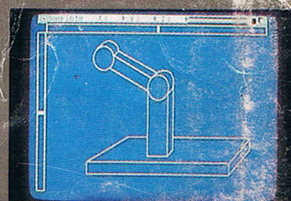
Silver generates a finished Ray traced image in as few as 4 minutes. Use light and camera view point to design stunning images and animations.
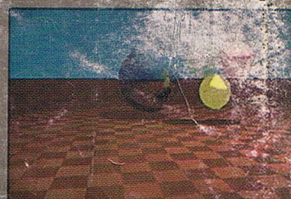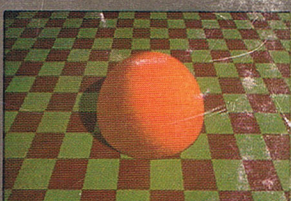
To design a scene and script for your animation is a snap with the Silver scene editor.

To view your movie is only a few simple keystrokes.
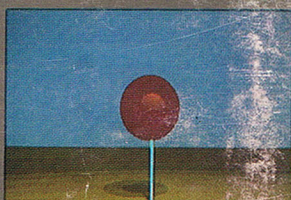
With Silver and your Amiga computer you can move your movie to Video Tape for final assembly editing and archive for future use.

SILVER FEATURES

- Creates 3D Ray Traced animations
- 512 frames per animation
- Speed of play back from 6 to 60 frames per second
- Simple to complex object generation
- Supports Genlock and overscan
- Has all Amiga screen resolutions
- Entire screens can be ray traced in as little as four minutes
- Complete use of mouse and keyboard commands
- Any IFF picture can be used as a background
- Hundreds of scenes per sequence are possible
- Complete users manual

- Operates on Amiga 500, 1000 or 2000
- External disk drive needed or Hard Drive
- Kickstart and Workbench 1.2 or greater is needed
- Imagination

Silver carries a
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